DOCUMENT RESUME

ED 227 820 IR 010 612

TITLE	Unesco Regional Meeting of Computer Centre Directors in Africa (Arusha, Tanzania, April 14-18, 1980). Final Report
INSTITUTION	United Nations Educational, Scientific, and Cultural Organization, Nairobi (Kenya). Regional Office of Science and Technology for Africa.
PUB DATE	Apr 80
NOTE	116p.; Best copy available.
PUB TYPE	Collected Works - Conference Proceedings (021) -- Viewpoints (120) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	Computer Literacy; *Computer Oriented Programs; Computer Programs; Computers; *Developing Nations; *Information Dissemination; Information Networks; International Organizations; Program Descriptions; *Regional Cooperation; *Technology Transfer; Workshops
IDENTIFIERS	*Africa; *Information Technology

ABSTRACT

The main points on the agenda of this meeting attended by eight chief participants from seven member states of UNESCO in the African Region and several observers were: (1) presentations by participants on their experiences in the application of informatics (i.e., computer applications in information dissemination) in the region; (2) problems in education and training in informatics; (3) formal education and training in informatics; (4) advanced workshops for existing personnel and education of management and users; (5) computer procurement in the region; (6) hardware and software developments and establishment of research projects; (7) computer applications with particular relevance to the region; and (8) major issues in informatics in Africa. This report summarizes the planning and conduct of the meetings as well as reports on informatics programs and presentations by the participants, and presents 13 recommendations formulated by the participants. Extensive appended materials include the meeting agenda; addresses delivered at the inauguration ceremony; presentations made by participants (M. N. J. Lambert, Zambia; P. E. Chilambe, Malawi; O. Abass, Nigeria; P. E. Mugambi, Uganda; R. J. P. Scott, Kenya; William D. S. Magambo, Tanzania; and Signate Cheikh Oumar, Senegal); reports on UNESCO's informatics program by E. A. Owolabi and the activities of the Organization of African Unity in informatics education by O. Abass; a working document prepared for the meeting; and a participant list. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED227820

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- This document has been reproduced as received from the person or organization originating it.
  Minor changes have been made to improve reproduction quality.
- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

REGIONAL MEETING OF COMPUTER CENTRE DIRECTORS IN AFRICA

Arusha (Tanzania) 14-18 April 1980

FINAL REPORT

IR010612

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Joseph Otieno Malo

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SUMMARY

The Regional meeting of Computer Centre Directors in Africa, convened by UNESCO through its Regional Office of Science and Technology for Africa (ROSTA), was held from 14 to 18 April 1980 in Arusha, Tanzania. The meeting was organized in accordance with Resolution 2/4. 3/1 adopted by the General Conference of Unesco at its 20th session, for the purpose of giving support to the development of informatics, and was held at the kind invitation of the Government of the United Republic of Tanzania; and with the cooperation and support of the Organization of African Unity's Science and Technology Research Commission, OAU/STRC.

Participants from 7 member states of Unesco in African Region took part in the meeting, as well as a representative of, OAU/STRC, and an observer of the Unesco National Commission in Tanzania. Altogether 12 participants including 3 members of the secretariat of the meeting took part.

The objectives of the meeting were to provide for exchange of experiences in the application of informatics; discuss establishment of software and hardware; review the problems of computer procurement; consider personnel exchange programme at regional level; examine initiation of regional network of cooperating informatics centres; present a report on the outcome of the meeting to the Director General; and authorize the rapporteur to represent the views of the meeting at a meeting of the rapporteurs of the regional meetings to be held in Paris later.

The themes mentioned above were discussed by the meeting in plenary. The report of the discussions of the meeting, the recommendations adopted, and the annexes constitute the Final Report of the meeting on the following pages.

LIST OF OFFICERS OF THE MEETING

Chairman

Mr. William D.S. Magambo
Data Processing Manager
Computer Department
Tanzania Electric Supply
Company Limited
Tanzania

Vice-Chairman

Mr. Signate Cheikh Oumar
Directeur Exploitation
D.T.A.I.
Ministere des Finances
Senegal

Rapporteur

Mr. O. Abass
Head of Department of Computer Sciences
University of Lagos
Nigeria

		Page
I	INTRODUCTION	4
II	GENERAL REPORT	7
	Unesco's programme in informatics	7
	OAU's programme in informatics	7
	Experiences of applications of informatics in the region	8
	Development of regional network of computer centres and exchange of personnel	10
	Problems of education and training in informatics	11
	Formal education and training in informatics	12
	Advanced workshops for existing personnel and education of management and users	13
	Computer equipment procurement in the region	14
	Hardware and software developments and establishments of research projects	16
	Computer applications and associated problem with particular relevance to the African region	17
III	RECOMMENDATIONS	18
	ANNEXES	
I	Agenda of the meeting	23
II	Addresses delivered at the inauguration ceremony	24
	Mr. E.A. Owolabi, Programme Specialist, UNESCO, Paris	27
	Honourable Tabitha Siwale, Minister for Education, United Republic of Tanzania	27
III	UNESCO and OAU/STRC informatics activities	29
	1. UNESCO's informatics Programme in the 1979-1980 biennium and outlook for the 1981-1983 triennium Mr. E.A. Owolabi	32
	2. Activities of OAU/STAC in informatics education Dr. O. Abass	32
		38

IV Presentation by Participants on experiences of application of informatics in the region

Mr. M.H.J. Lambert - Zambia 42

Mr. P.E. Chilambe - Malawi 48

Dr. O. Abass - Nigeria 55

Professor P.E. Mugambi - Uganda 62

Professor A.J.P. Scott 65

Mr. William D.S. Magambo - Tanzania 70

Professor Signate Cheikh Oumar - Senegal 76

V Working Document 86

VI List of Participants 113

I INTRODUCTION

Organization, objectives and Scope of the meeting.

1. The regional meeting of Computer Centre Directors in Africa was held in Arusha Tanzania from 14th to 18th April 1980. The meeting was organized by UNESCO through its ROSTA office in accordance with Resolution 2/4.3/1 adopted by the General Conference at its 20th session, for the purpose of giving support to the development of informatics.

2. The objectives of the Regional Meeting were the following:

   a) Provide for exchange of experiences in the application of informatics

   b) Discuss establishment of software exchange programmes and common maintainance efforts of software and hardware.

   c) Review the problems of computer procurement

   d) Consider personnel exchange programme at regional level.

   e) Examine initiation of regional network of cooperating informatics centres

   f) Present a report on the outcome of the meeting to the Director General.

   g) Authorize the rapporteur to represent the views of the meeting at a meeting of the rapporteurs of the regional meetings to be held in Paris later.

3. The conference had the following main points on its agenda: Presentation by participants on experiences of applications of informatics in the region; problems of Education and training in informatics; Formal education and training in informatics; advanced workshops for existing personnel and education of management and users; Computer procurement in the region; Hardware and software developments and establishment of research project; Computer applications with particular relevance to the African region; major informatics issues for the region of Africa.

4. Eight chief particpants from 7 member of states of UNESCO in the African Region, 1 observer from UNESCO National Commission in Tanzania attended the meeting. In addition to 3 members of the Secretariat of the meeting there was a total of 12 participants.

Preparations for the Meeting

5. As part of the advance preparations for the meeting, a significant effort was made to identify the relevant issues and to assess the state of activities in informatics in a number of Countries in the African Region. The working document available for the meeting adequately reflected this preparation.

Opening of the Meeting

6. The opening ceremony took place on 14th April 1980 at 10.00a.m. in the Conference Room of the Eastern and Southern African Management Institute Arusha, Tanzania by the Hon. Tabitha Siwale, Minister of Education, in Tanzania.

7. The Director of Eastern and Southern African Management Institute welcomed the participants and wished them every success in their deliberations.

8. Mr. E.A. Owolabi a UNESCO programme specialist made a few remarks on behalf of the Director General of UNESCO and the Director of the UNESCO office in Nairobi. He emphasized that UNESCO has since its inception been involved in the promotion of scientific and technological research and training in specific fields, including the informatics field to meet the needs of developing Countries; and its programmes for research and training are aimed at assisting the developing Countries.

9. He finally hoped that since participants of the meeting are specialists in informatics they would share their experiences and knowledge and try to find the solutions to the problems confronting them and will, of course, identify specific areas of regional cooperation for their mutual benefit. He wished the meeting success in its work and a pleasant stay in Arusha.

10. The Director of the Institute called on the Hon. Tabitha Siwale the the Minister of Education in Tanzania to officially open the meeting.

11. The Minister on behalf of the host Government warmly welcomed the participants to the Country and wished them a happy stay in the Country.

12. She went on to say that the world of computer science is probably the most advanced technological invention with which man can nowadays enhance his pace of development. She expressed her concern that successful use of computers have only been common in the developed countries while the developing countries are still finding problems with using this machine that has great potentials for development.

13. The Minister warned that while looking into the usefulness of the Computer in enhancing development we should also be careful not to lose sight of its negative effects on the development of the people or society it is supposed to help. There amay be a danger that the Computer can disrupt certain cultural trends in society, or deprive the mind of its capacity to think and the body of its necessity to engage in physical work.

14. She finally thanked UNESCO and the Director of the Institute for hosting the meeting and also thanked everybody who attended. She wished the meeting every success.

Work of the Meeting

15. Following the opening ceremony, the meeting on the proposal of the head of the Malawi delegation, seconded by the head of the delegation of Senegal and Nigeria, elected Mr. William Magambo head of the Tanzania delegation as its Chairman.

16. Mr. Magambo on behalf of his Government and in his personal capacity thanked the participants of the Regional Meeting of Computer Centre Directors on his election as the Chairman of the Meeting.

17. Other officers were also elected including the Vice Chairman Prof. Signate Cheikh of Senegal the Repporteur was Dr. O. Abass of Nigeria.

18. The Meeting then discussed its Rules of Procedures as well as its agenda.

19. All sessions of the meeting were held in plenary and had deliberations on a lot of issues related to the terms of reference and the agenda. After lengthy discussions the meeting discussed, ammended and adopted 13 draft recommendations.

20. At the final plenary meeting on April 18th 1980, the Repporteur presented the draft report; this together with the draft recommendations concerning points on the agenda, were examined and then adopted by the meeting. The report and recommendations, adopted are reproduced in tha appending.

Closing the Meeting

21. Prior to the Chairman's formal closure of the meeting, Mr. Cwolabi on behalf of the Director General of UNESCO, thanked the participants and conveyed the delegates gratitude to the Tanzania Government.

22. The Chairman, Mr. Magambo declaring the meeting closed, concluded with an expression of thanks to the Director General of UNESCO, the participants, the Vice Chairman, the Repporteur members of the Secretariat, and other personnel for their important contribution to the success of the meeting.

II GENERAL REPORT

UNESCO'S PROGRAMME IN INFORMATICS

1. In his address the UNESCO representative outlined Unesco's programme on informatics which included:

   sponsorship of regional seminars;
   support for professional societies at international and regional levels;
   organization of regional meetings of computer centre directors;
   establishment of properly equipped centres;
   support for post-graduate and short term courses;
   curriculum development; and
   provision of fellowships especially under participation programme

   Participants expressed appreciation for Unesco's activities in informatics in developing coutnries and requested information on these on a regular basis.

2. Most participants expressed their interest in the manner in which their national computer societies can become members of IFIP. Information about the forthcoming IFIP congress in Australia and Tokyo was provided.

3. Participants expressed their concern at the long lead time required to pass institutional requests for Unesco assistance through their respective Unesco national commissions to the Unesco regional office before even reaching the Unesco headquarters.

4. Participants were informed that under participation programme individual requests for projects can be channelled through Unesco National Commission in the country.

5. One participant proposed, and was supported by other participants, that each Unesco regional office should appoint full-time officers responsible for all aspects of their own informatics programme in the region.

OAU's programme in informatics

6. The OAU's programme in informatics which was outlined by the OAU/STRC representative included:

   - support for the International Post-graduate Diploma in Computer Sciences at the University of Lagos;
   - support for regional workshop and symposia and
   - staff exchange within the region.

7. All participants were recommended to take full advantage of the offer by the OAU to provide scholarships to attend seminars and the courses including the one in Lagos.

8. One participant indicated that exchange of staff had been successfully implemented between instituttions within Nigeria and recommended that staff exchanges be set up within the region on a term, semester or sabbatical basis.

Experiences of applications of informatics in the region

9. Participants from the following countries gave presentations on their experience and application of informatics in each country:

Zambia;
Malawi;
Nigeria;
Uganda;
Kenya;
Senegal;
Tanzania

(a) Zambia

10. One of the major manufacturers has now discontinued new rental contracts for computers. A programming certificate course at the Zambia Institute of Technology has had to be discontinued due to lack of staff. The Government of the Republic of Zambia has a Computer Utilization Committee which oversees all new acquisitions of computing equipment for the public sector. A Computer Society of Zambia exists and is currently compiling a register of computer personnel in the country.

(b) Malawi

11. There has been a rapid increase of new installations in the past 2 years with consultancy companies playing a major role in systems development. There is a serious exodus of public sector staff to the private sector. There is a serious lack of local training facilities which has required overseas sponsorship for training. The local training available is very expensive. There is an active computer society of Malawi that will be running courses at the Polytechnic.

(c) Nigeria

12. There are 6 out of the 13 universitites in the country with computer science departments. The University of Lagos runs extension courses, service courses, under-graduate degree, an international post-graduate diploma in computer sciencies as well as M.Sc. and Ph.D. programmes.

A major computer supplier has withdrawn from the country owing to its inability to comply with indigenization regulations and this necessitates the maintenance to be done by a local company. At the moment, before the Federal Government grants a licence for the importation of computers, guidelines stipulated by the Central Computer Committee have to be complied with. The Computer Association of Nigeria (CAN) held its inaugural meeting in April 1980. The CAN is sponsoring a seminar on Microprocessors later in 1980 with support from Unesco and IFIP. There is also an active Nigerian Association of Computer Science Students (NACOSS). Major areas of applications are in Oil Exploration, Scientific and Engineering research, Business and industrial applications, Public Administration, University Administration, Research in Education and Social Sciences, Forecasting, Processing of Examination results, Medical Applications, Government Statistics and Census.

(d) Uganda

13. Computing in the country is a picture of stagnation, neglect, and obsolescence. At Makerere University the computer installation is part of the Mathematics Department but the intention is to establish an Institute of Computer Science. Some of the computers installed are not working due to non-payment of charges to the vendors. There are major problems of the supply of paper and spare parts. The only training currently available is on-the-job. Applications are payroll in Government, billing by the Uganda Electricity Board and the Post Office, research at the University and some government agricultural research centres, processing of admissions to the university, processing of school examination results, and census.

(e) Kenya

14. There is one national university which has an Institute of Computer Science that currently provides all the computer facilities for the University of Nairobi. All students from the faculties of Science, Commerce and Engineering attended compulsory service courses in computing using interactive terminals. A post-graduate diploma in computer systems is expected to start in 1980 for 12 students. A framework for advanced workshops in data processing subjects is to start. A directory of computer installations and associated data is being compiled. One private company has started the local assembly of its own designed business computer system. The computer Association of East Africa has met since 1970. Major areas of application are in commerce, central and local government accounting, utility biling, university administration and research, on-line data collection and interactive program development.

(f) Senegal

15. The only education and training in informatics is provided by the University of Dakaar as service courses. Training is available through the National Computer Centre. Most vendor training is undertaken outside the country. Computers are installed in public, semi-public, private banks and other private corporations. No data transmission is possible at present. Considerable work has been undertaken in the area of bibliography data files. The Government established a national committee for informatics in 1972 chaired by the Prime Minister. The policy of decentralization is currently being pursued.

(g) Tanzania

16. The computers in Tanzania are nearly all from one manufacturer, and are over 7 years old. The major supplier has given warning to discontinue maintenance on one range of computers at the end of 1980, and all new computers will have to be purchased and not rented. There is little formal education in the country apart from the information systems courses run by the East and South African Management Institute in Arusha. There is only one expatriate computer employee in the country. Foreign donors are relied upon for training even at the regional centre in Nairobi. There are no user groups or computer associations. The major application areas are customer utility billing, payroll, stock recording and control, census, accounting, research and statistics.

A common observation made by all participants was the large turnover of computer personnel especially in the public sector owing to poor remuneration and lack of prospect vis-a-vis the private sector.

Development of regional network of computer centres and exchange of personnel

17. A proposal for the establishment of a regional network of computer centres in Africa was discussed by all participants. As part of the network, establishment of National Computer Centres as coordinating focus for the network in each country was suggested. The functions of the network outlined include:

promote awareness and review informatics;
monitor developments of participating institutions;
assist and provide services for establishment of new education and training centres;
assist with priority areas of collaborative research;
encourage and promote exchange of personnel;
orgarize short-term seminars;
assist with proper service and maintenance of hardware;
promote development and exchange of software;
promote exchange and dissemination of publications; and
promote exchange of experiences in informatics.

18. Participants endorsed the establishment of this form of regional cooperation. A number of participants suggested that establishment of such regional cooperation can be started with regular regional contact and exchange of personnel. One delegate cited an example of regional cooperation that has taken place between the West African and the former East African Examination Councils. It was noted that there already exists a regional network for engineering temporarily housed at the/Regional Office in Nairobi. Participants were urged to promote the network concept to their respective home government.

19. It was emphasized that the network requires financial and other supports from member countries and that each country would have to nominate an institution to become a National Coordinating Agency (NCA) to be the link in the network.

20. Most participants expressed their view that the long term objective for the network would be physical links of cooperating computer centres.

Problems of education and training in informatics

21. In the discussion of the problems of education and training in informatics, the following points were emphasized:

subject nomenclature related to computer science informatics, information processing;
estimates of education and training needs on a national basis;
practical oriented training requirement;
equipment for education and training;
retention of training staff as public employees with attractions of the private sector;
private computer training schools;
examination and assessment;
Pan African association of University Departments/ Institutes of Institutions
coordination of training on a regional basis;

22. Most participants expressed considerable interest in the introduction of a professional supplement for public sector employees in order to retain staff including teachers of informatics.

23. A unanimous view by all participants expressed the review of the use of aptitude tests for the selection of new staff for careers in informatics.

24. A number of participants enderscored the priority of practically oriented training to be provided as a priority for middle level technicians below the level of graduates and above the level of operators.

25. Several participants expressed the view that government data processing centres should be reporting to the top management in order to widen its utility throughout the organisations as opposed to having it controlled by a single department.

26. Concern was expressed that a number of well qualified nationals continue to work overseas in developed countries instead of returning to their home countries to take the lead in the exploitation of informatics for development.

27. A general feeling by participants was the standard for nomenclature.

28. Whilst concern was expressed by some participants for the lack of control on the exploitation of the private computer schools, some other participants expressed appreciation for their efforts and outlined the problems of providing suitable training. One participant warned of the legal problems of trying to outlaw their existence.

29. Several participants emphasised how important high level academic training in informatics is to produce local specialists to spear head national development of informatics.

Formal education and training in informatics

30. Discussions on formal education and training in informatics included the following:

Postgraduate training;
Undergraduate education including at least one course for all students;
A Level (Higher) school courses;
Systems Analysis and Design training;
Data Entry and Data Control Personnel training;
Vendors courses.

31. A general suggestion welcomed by all delegates was the compilation of a compendium of institutions and courses available in the region.

32. The UNESCO delegate requested delegates to consider the draft modulr curriculum for informatics. A unanimous view was that the curriculum for the region should not be at variance with that from other regions except perhaps on emphasis, and that the words "developing countries" should be deleted from the proposed modular curricula. Some delegates felt that more emphasis should be given to the principles of management, accounting, statistical computation, and impact of informatics on society in addition to other subjects in informatics curricula.

33. Some delegates suggested the establishment of a simple network on education and training in the region prior to the formal network being established.

34. One delegate suggested that the extension course syllabus run at the University of Lagos could be used in other parts of the region.

Advanced workshops for existing personnel and education of management and users

35. While discussing continuing education for informatics personnel, management, decision makers, and users, emphasis was placed on:

establishment of framework for advanced courses on a national basis,
video recorded teaching packages;
modularly designed courses;
part-time extramural courses;
management appreciation courses;
Government Institutes of Administration;
training of trainers; and
training and certification of already experienced personnel without earlier formal training.

36. Participants agreed that fast changing technology requires continual up-dating of knowledge by all practitioners

37. Several participants felt a desire to evaluate some of the course packages available while one participant had no use for these courses.

38. The participants agreed that all appropriate institutions involved with management training should be equipped with equipment and personnel to provide informatics as part of modern management courses. The provision of training facilities for the trainers was regarded as a priority for these institutions.

39. Attention of the participants was directed to the seminars, workshops, short-term courses and international post-graduate courses organised by UNESCO in informatics.

40. One participants recommended that institutions involved with the general level of education for management and users should make efforts to subscribe to the more non-technical journals e.g. COMPUTING DATAMATION.

41. Several participants indicated that their national computer societies were actively engaged or planning to be engaged in these areas of education and training.

42. One participant outlined the necessity for a course to prepare data processing managers for conversion activities from one computer system to another.

43. Mention was made of UNESCO's efforts to solicit the collaboration of the multi-national computer manufacturers to assist with aid to young national informaticians, e.g. in the field of software engineering.

44. The proposed seminar on Computers and Telecommunications to be held in Abidjan for francophone countries was mentioned and most participants requested a similar seminar to be run for English speaking participants.

45. One delegate suggested that existing centres for Continuing Education be mobilised to provide some of these courses.

46. Most participants stressed the need for agencies like UNESCO to provide fellowships to enable participants from Africa to attend courses, workshops and seminars outside their countries.

Computer equipment procurement in the region

47. The problems of computer equipment procurement in the region were outlined and they included:

dissatisfaction of users of performance of computer equipment;
failure of users to clearly identify their needs while negotiating with suppliers.

The guidelines for procurement suggested were:

top management participation in procurement;
adequate planning and control; and
adequate consideration of human problems.

The processes of computer procurement suggested were:

feasibility study;
preparation of specifications;
obtaining of equipment proposals; and
ranking and selection of suppliers.

48. Several participants, proposed additional aspects to be covered in the guidelines presented which included the problems of installation of third party supply of special purpose hardware units and software, the prior appointment of data processing staff before installation of equipment, and the production of detailed 2-year and outline 5 year plans, and peculiar local conditions, (e.g. power fluctuations).

49. It was emphasised how important it was for a set of guidelines on procurement to be widely publicised within each nation.

50. Most participants expressed the concern that vendors fail to underscore the full requirement for staff prior to the time a new installation is commissioned.

51. Major concern was expressed about the operation of vendors.

51. Major concern was expressed about the operation of vendors in the region in relation to contracts for equipment, these include:

    limited choice of equipment marketed; in some countries no choice of rental of equipment is permitted and appears to be an increasing occurrence; obsolete equipment being supplied; payments to vendors required in foreign currency; exhorbitant cost of equipment compared to country of manufacture.

52. Some participants suggested that UNESCO, IBI and the proposed Regional network should assist with the procurement process in the following ways:

    assistance with provision of independent procurement consultancy, review the detailed contracts in relation to laws of both the countries of manufacture and installation; undertake a review of pricing structure for equipment supplied in the region.

53. A number of participants agreed with the proposal to have regional funds available to continue payment of rentals and maintenance when a country experiences temporary severe foreign exchange problems.

54. One participant reported the switch-off of a computer due to non-payment of foreign exchange by a government. Another participant reported the unavailability of spareparts resulting in one computer being down for 6 months without back-up.

55. Some countries do require local conditions to be met e.g. power supply.

56. One participant focussed on the excess usage and extra shift clauses in contracts and questioned their relevance in the countries where outright purchase is the procurement practice.

57. One participant suggested the importance of including benchmarks for the procurement of new informatics equipment and requested from UNESCO to prepare a guide on the evaluation of benchmarks. The benchmark enables the user to evaluate the technical facilities of the equipment and lets the vendor put theory into practice.

58. It was suggested that national computer professional societies should have a strong focus on national government in formulation of procurement policies.

59. Several participants suggested that hardware not enjoying maintenance support in a country should not be imported on any account.

Hardware and software developments and establishment of research projects.

61. Discussions about hardware focussed on:

Rational utilization of centralized large computers by time sharing;
decentralization and distributed processing based on mini and micro computers; transaction processing systems;
enquiry systems;
word processing systems;
and local assembly plants of computers as a means of developing expertise for technology transfer.

62. The development in software outlined included:

predominant programming languages used;
usage of application packages;
systems software largely imported;
unbundling of software charges;
development of software bureaux and consultants;
structured programming techniques; availability of applications packages world wide and their local support.

63. The establishment of research projects was outlined and included:

need to compile directory of research undertaking in the region;
on-going projects on computers and development policy and statistics in each country;
experiments with post office authorities on provision of dial-up mode of data communication;
exploitation of microprocessor in product development;
use of word processors to be studied with particular regard to the socio-economic effect on employment;
automation of national libraries; and use of cheap portable computers in the field of computer assisted instruction.

64. Some participants suggested the priority for the region to be in the development of sufficient manpower to be able to increase local production of software. At the time serious efforts must be made to introduce modern and advanced software development technique including software engineering.

65. One participant raised the problem of compatibility of the different versions of programming languages available in the region and suggested work be carried out on this problem.

66. Where applications packages are available to users with little computer knowledge sufficient technical support staff must be available to avoid abuse of the techniques which in turn pass the blame to the use of the computers.

67. Most participants expressed the desire for more cooperation and exchange on all aspects of software developments and research work undertaken within region.

68. One participant suggested that UNESCO be involved in establishing mechanism for the transfer of informatics technology to Africa with interested computer manufacturers. It was suggested that more fruitful cooperation on equal partnership basis could be established.

Computer applications and associated problems with particular relevance to the Africa region

69. The most important areas of application were drawn up from the response of the delegates, these are

Census;
Health;
Accounting;
Education, e.g. examinations processing;
Migration statistics;
Agricultural applications;
Environment control, e.g. meteorology;
Motor vehicle registration;
Votes registration;
Payroll, Billing, Hydrology, Exploration and Mining.

70. Several participants supported the meeting of special interest groups in the region in order to share experiences and avoid duplication of effort.

71. One participant indicate the experience of one foreign expert not passing on information related to the project on which local staff were to take over. It was stressed how important it is to inlude a training element in all requests for technical assistance.

72. It was agreed that more emphasis should be given on the exploitation of the planning applications that can be used for development. The main thrust for this move will have to come from Universities by promoting more courses on planning and modelling.

73. One participant requested that library computerisation should be explored in the region to ascertain different approaches, stages of system development, and elimination of expensive waste emanating from duplication of efforts.

74. One participant indicated the advantages that computers can provide for the early computerisation of records on a national basis in a way not possible in more developed regions, e.g. national pupil number used throughout the educational system from primary to tertiary level.

75. Some participants proposed that a conference be held in 1981 to consider the application of computers for the development in Africa.

III RECOMMENDATIONS

RECOMMENDATION 1

The Regional Meeting of Computer Centre Directors in Africa at Arusha(Tanzania) from 14th to 18th April, 1980

Expresses its profound gratitude to Honourable Tabitha Siwale, Minister for Education, United Republic of Tanzania for participating in the inauguration of the meeting and for the support she thereby gave to the meeting;

Expresses its gratitude to the Government of the United Republic of Tanzania for all the facilities made available to the meeting, such facilities that made it possible for the meeting to carry out its work under satisfactory conditions;

Thanks the authorities of Eastern and Southern African Management Institute and the Tanzanian people for the warm hospitality shown to it and for the expressions of goodwill it received.

RECOMMENDATION 2

The meeting

Conscious of the importance of informatics in the development of all countries in the region;

Noting the wide gap between this region and industrialized countries in informatics;

Recognizing that this gap can be reduced through cooperative effort at regional level;

Taking into account the points raised in the working document concerning establishment of the regional network;

Recognizing the need to control the activities of computer vendors especially preventing them from transfering obsolete technology into the region.

Recommends

1. The establishment of an Informatics Network in Africa.
2. That Governments in Africa should encourage the establishment of the network by making positive contribution including financial and political support.
3. That international organizations such as UNESCO, UNDP, and OAU/STRC promote the establishment of the network.

RECOMMENDATION 3

Considering the large size of Africa region;

Realizing that much has to be done to improve informatics activities in the region;

Conscious of the importance of coordinating efforts of UNESCO in informatics;

Recommends that:

An informatics specialist be added by UNESCO to its Regional Office for Science and Technology in Africa (ROSTA) currently situated at Nairobi.

RECOMMENDATION 4

Reaffirming the importance of education and training as prerequisite for the development of capacity in informatics;

Observing the scarce opportunities for informatics education and training in the region;

Recommends that:

1. Governments should make deliberate efforts for establishment of informatics education and training facilities;

2. Where there are such education and training facilities (e.g. in Universities and other institutions) each government should encourage improvement and expansion of these facilities.

RECOMMENDATION 5

Realizing the perverseve nature of informatics as it is affecting all spheres of life.

Recommends that:

1. Development of curricula in informatics should take account of national needs of each country as well as the academic content required for an appropriate education;

2. UNESCO's efforts be intensified towards producing a modular curriculum that can be adopted in different communities but ensure that it does not provide for inferior informatics education in developing countries.

RECOMMENDATION 6

Considering the dynamic nature of informatics;

Realizing the importance of constant updating of knowledge in areas of informatics;

Recommends that:

1. UNESCO and other international organizations strengthen their training support including seminars, workshops, short-term courses and conferences, in and out of African countries and facilitate the frequent participation of informatics specialists from African countries;

2. International non-governmental organisations (NGO's) in informatics such as IFIP extend their current awareness programme including seminars and workshops to Africa.

RECOMMENDATION 7

Realizing the vital role that National informatics societies can play in informatics education, professional ethics, dissemination and diffusion of information about current development in informatics education and technology;

Recommends that:

1. Non-governmental national informatics societies in each country of Africa be organized.

2. The national informatics societies should cooperate at regional level for the purpose of strengthening one another, sharing experiences, promoting professional standards and practice, organizing regional conferences, seminars and workshops, as well as promoting lateral transfer of technology within the region.

3. UNESCO, OAU/STRC, IBI and NGO's such as IFIP encourage the formation and activities of such national and regional informatics societies.

RECOMMENDATION 8

Noting the haphazard nature of informatics development in the region;

Reaffirming the importance of well structured strategies and policies in informatics as highlighted at the SPIN Conference in 1978;

Recognizing the importance of informatics in political, economic, social, technological and industrial life of a country;

Recommends that:

1. Governments, as a matter of necessity and urgency, establish statutory bodies for the formulation of strategies and policies in informatics as well as monitoring of the implementation of such policies;

2. Each country should develop a national policy on education and training in informatics as an element of national strategies and policies for informatics;

3. Strategies and policies in each country should include elements geared towards self-dependence in the production and procurement of both informatics hardware and software;

4. Account should be taken of the impact of informatics on society in the formulation of the national strategies and policies;

RECOMMENDATION 9

Realizing the importance of information on informatics;

Anxious to ensure that adequate and up-to-date information is readily and continously made available to all countries in Africa;

Recommends that:

1. UNESCO strengthens its information apparatus for difusion and dissimination of information on informatics;

2. A compendium of institutions offering education and training in informatics in Africa be prepared and distributed by UNESCO.

3. A newsletter on informatics in Africa be established as part of the functions of the proposed informatics network.

4. UNESCO's UNISIST and OAU strengthen their collaborative effort in the establishment and expansion of the Data Bank on Technologies in Africa the pilot phase of which is located in the Computer Centre of the University of Ife, Nigeria, and that all countries take advantage of the Data Bank.

5. Information centres on informatics should be created in each country in association with national informatics societies.

6. Each country in the region should prepare a directory of computer installations, which should include quantitative data on current staff and projections, applications and equipment utilization. Such a directory should be up-dated from time to time.

7. A compendium of national informatics societies in Africa be prepared by the secretariat of the proposed regional network.

RECOMMENDATION 10

Reaffirming the importance of hardware and software maintenance for the effective utilization of informatics equipment.

Taking into account the considerable outlay, particularly in terms of appropriate manpower, needed to create a national maintenance capability;

Recommends that:

UNESCO, OAU and other intergovernmental organizations take all necessary steps to further the establishment of regional centres whose functions will include undertaking in whole or in part, hardware and software maintenance as well as training.

RECOMMENDATION 11

Noting the higher cost of both software and hardware informatics equipment in the region;

Taking into account that terms of contracts are always in favour of vendors in the region;

Observing that both higher costs and unfavourable contractual terms result from absence of clear guidelines on procurement and statutory regulations on signing informatics contracts in the region;

Recommends that:

1. Each country should draw up guidelines on procurement of software and hardware with a view to controlling costs and contractual arrangements;

2. As a further assistance to countries in this region UNESCO organizes seminars and workshops in this region on contract negotiations and management in respect of procurement of both informatics software and hardware.

RECOMMENDATION 12

Conscious of the importance of rationalization in the application of informatics for development.

Recommends that:

A conference on application of informatics in Africa be organized by UNESCO in 1981.

RECOMMENDATION 13

Noting that a meeting of rapporteurs of different regional meetings of computer centre directors will be convened later in Paris.

Recommends that:

The rapporteur of this Regional Meeting of Computer Centre Directors in Africa represents the views of the meeting in the meeting of rapporteurs in Paris whenever it is convened.

ANNEXES

I Agenda of the meeting 23

II Addresses delivered at the inauguration ceremony 24

Mr. E.A. Owolabi, Programme Specialist, UNESCO, Paris 27

Honourable Tabitha Siwale, Minister for Education, United Republic of Tanzania 27

III UNESCO and OUA/STRC informatics activities 29

1. UNESCO's informatics programme in the 1979-1980 biennium and outlook for the 1981-1983 triennium - Mr. E.A. Owolabi 32

2. Activities of OUA/STRC in informatics education - Dr. O. Abass 32

IV Presentation by participants on experiences of applications of informatics in the region;

1. Mr. M.N.J. Lambert - Zambia 38

2. Mr. P.E. Chilambe - Malawi 42

3. Dr. O. Abass - Nigeria 48

4. Prof. P.E. Mugambi - Uganda 55

5. Prof. R.J.P. Scott - Kenya 62

6. Mr. William D.S. Magambo - Tanzania 65

V Working Document 70

VI List of participants 76

103

ANNEX I

Regional Meeting of Computer Centre Directors in Africa

April 14th - 19th, 1980

Agenda

Day 1.

9.00 Registration

11.00 Official opening by Minister of Education, Tanzania

12.30 Lunch

14.30 Election of Chairman, Vice Chirman, and Rapporteur
Discussion of Agenda

Day 2.

9.00 Presentation by UNESCO on its programme on informatics
Activities of OAU in informatics

10.30 Coffee

11.00 Presentation by participants on experiences of applications of informatics in the region.

12.30 Lunch

14.30 Presentation by participants on experiences of applications of informatics in the region

16.30 Coffee

20.00 Wildlife film

Day 3

9.00 Problems of Education and training in informatics

10.30 Coffee

11.00 Formal Education and training in informatics

12.30 Lunch

14.30 Advanced workshops for existing personnel and education of management and users.

16.00 Visit to Mount Meru Game Senctury

Day 4.

9.00	Computer equipment procurement in the region
10.30	Coffee
11.00	Hardware and software developments and establishment of research projects
12.30	Lunch
14.30	Computer applications with particular relevance to the African region:
16.30	Coffee

Day 5.

9.00	Major informatics issues for the region of Africa
10.30	Coffee
11.00	Major informatics issues for the region of Africa (continued).
12.30	Lunch
14.30	Concluding session Adoption of the draft report
17.30	Coffee
20.00	Reception Dispersal

EASTERN AND SOUTHERN AFRICAN MANAGEMENT INSTITUTE

PROGRAMME OF THE INAUGURAL SESSION OF THE REGIONAL MEETING OF COMPUTER CENTRE DIRECTORS IN AFRICA

Date: Monday, 14th April, 1980

Time: 10.00a.m.

Place: Eastern and Southern African Management Institute, Arusha, Tanzania

1. Welcome Speech by Professor J.J. Okumu, Director Eastern and Southern African Management Institute, Arusha, Tanzania

2. Introduction of the Meeting by Mr. E.A. Owolabi, Programme Specialist, UNESCO, Paris

3. Inauguration Speech by Hounarable Tabitha Siwale, Minister for Education, United Republic of Tanzania

4. Closing Remarks by Martin J. Shio, Eastern and Southern African Management Institute, Arusha, Tanzania

5. Coffee

ADDRESSES DELIVERED AT THE INAUGURATION CEREMONY

Address by
Mr. E.A. Owolabi,
Programme Specialist, Informatics Section,
Division of Scientific Research and
Higher Education, UNESCO,
Paris.

It is a privilege and pleasure for me to make a few remarks on behalf of the Director General of Unesco and the Director of the Unesco Regional Office in Nairobi, on this auspicious occasion of the opening of the Regional Meeting of Computer Centre Directors in Africa.

I should, first of all, like to express my gratitude to the hosts, the Government of United Republic of Tanzania, National Commission for Cooperation with Unesco, Eastern and Southern African Management Institute, for their kind cooperation and for making excellent arrangements for the meeting. I should also like to extend my sincere thanks to the Member States of the region for responding to our invitations by sending participants and observers to the meeting. My appreciation and gratitude go also to the Organisation of African Unity's Science and Technology Research Commission, OAU/STRC for its support including sending representative to participate in the meeting. As you know, Unesco, since its inception, has been involved in the promotion of scientific and technological research and training in specific fields to meet the needs of the developing countries, and its programmes for research and training are aimed at assisting the developing countries. Unesco has also been dealing with the promotion of cooperation for the worldwide progress of all forms of scientific and technoligical development, research, education and training since its establishment in 1946.

The Intergovernmental Conference on Strategies and Policies for Informatics (SPIN), organized jointly by Unesco and the Intergovernmental Bureau of Informatics (IBI) in Torremolinos, Spain, in 1978 was the first conference of its kind to emphasize the importance of informatics for national life and development and the necessity of international cooperation to achieve many of the objectives that the individual countries have set for themselves. As a follow-up to the SPIN Conference, Unesco is at present in the process of organizing meetings of Computer Centre Directors in different regions of the world so as to promote more regional cooperation in informatics. Unesco had also convened an Advisory Group of Experts in Informatics (AGI) in September 1979 in Paris to advise the Director-General on new modalities for Unesco's programme in informatics. In preparation for the SPIN Conference Unesco had organized a Regional Consultation on Informatics in Africa in Kumasi (Ghana) in 1977 which reviewed the strategies and policies for the development for informatics, applications of informatics, technology of informatics, education and training for informatics and made several recommendations on the promotion of regional cooperation in informatics. The Meeting of the Computer Centre Directors here is the second activity organized by Unesco in this region for the purpose of promoting more regional cooperation by establishing institutional and individual links among the Computer Centres through the establishment of a regional network.

As you are well aware, informatics is bringing about an upheavel comparable in scale and importance to other major discoveries in the history of mankind and its rapid development goes back only to 1950s. The development of solid-state devices and miniaturisation on the hardware side and mathematics and logic on the software side have made the design, manufacturing, and operation of the modern computer for various purpose possible in a short span of few years, and at the same time, the applications of informatics is affecting almost all aspects of industrial production and management, scientific research and applications, with a tremendous impact on economic and social life. For the developing countries one of the important problems of informatics is the present concentration of the technology in a few countries and in the hands of a small number of corporations and the developing countries should not fall behind yet again in this important and far-reaching field of informatics and be trapped by this formidable new instrument of progress from a different world.

In the next few days the Meeting will consider the establishment of a Regional Network of Computer Centres in this region, and at the same time, will discuss, deliberate and formulate cooperative programmes of the network in various aspects of informatics such as policy, applications, software exchange, maintenance efforts on both hardware and software, technology and hardware procurement, personnel exchange progrmmes, research, education and training of personnel at different levels, and exchange of information on informatics development.

The participants of this meeting being specialists in informatics will share their experiences and knowledge and try to find the solutions to the common problems confronting them, and will, of course, identify specific areas for regional cooperation for their mutual benefit. I wish them fruitful deliberations, success in their work, and a pleasant stay in Arusha.

Thanking you very much.

AN ADDRESS BY HON. TABITHA SIWALE, MP, MINISTER FOR NATIONAL EDUCATION GIVEN ON THE OCCASION OF THE OPENING OF THE REGIONAL MEETING OF COMPUTER CENTRE DIRECTORS IN AFRICA, AT THE EASTERN AND SOUTHERN AFRICAN MANAGEMENT INSTITUTE, ARUSHA.

ON 14TH APRIL, 1980

Mr. Chairman, Ladies and Gentlemen,

On behalf of the Tanzania Government, I want to warmly welcome you to this country and to wish you a happy stay in Tanzania. Please feel at home, and when you go back to your respective countries, after the meeting, convey our warm regards to our comrades there.

I am deligheted to have been given the opportunity to open this Regional Meeting of Computer Centre Directors which I gather is the first one of its kind to be held in Africa.

I am given to understand that all of you are aware that this meeting is a follow-up on the Inter-governmental Conference on Strategies and Policies for Informatics (SPIN) which was held in Spain last year to discuss the importance of informatics for national development, and that the Conference adopted 44 recommendations which constitute an action programme addressed to the member states and to international and inter-governmental organisations for the accelerated introduction and national use of informatics as an effective tool for development.

The world of computer science is probably the most advanced technological invention with which man can nowadays enhance his pace in development very much faster than has been the case in the past. This scientific invention has been initially developed at very great cost, and as a result its market has all the way been a monopoly of the developed countries.

The use of computers in developing countries is very much dependent on a supply market from developed countries. This reminds me of monopolies on such marketable commodies as the coca-cola soft drink and especially the hybrid chicken whose formula I understand cannot be easily divulged. This kind of relationship is not a healthy one and needs therefore to be looked into carefully with a view to improving it for the benefit of both the developing and the developed countries.

It is a known fact that a computer is a device which can store, analyse, manipulate and present data in a variety of ways and has applications in almost all spheres of human activity. Its efficiency in helping man to cope with the "information explosion", and in bringing some order to the complexity of life, makes it seemingly a highly attractive and popular device to a large number of organisations.

I beleive that your meeting will discuss this aspect of computer development, namely its usefulness, as it affects the needs of society. But much more important, I think, will be your contribution in the way of suggestions and especially proposals as to what role the computer ought to play in helping to speed up development in developing countries. I am saying this because the advancement of the computer in developed countries has been activated by the need to raise the standard of life and to improve the life style of its peoples.

While looking into the usefulness of the computer in enhancing development, you should also, I think, be careful not to lose sight of its negative effects on the development of the people or society it is supposed to help. There may be a danger that the computer can disrupt certain cultural trends in society, or deprive the mind of its capacity to think and the body of its necessity to engage in physical work.

In developed countries where the computer is put to use extensively, its negative effects have resulted in a high degree of emotional reaction against it. These negative effects include, at the one end of the spectrum, the computer's menacing challenge to man himself as a problem solver and, at the other end of the spectrum, the frightening prospect of replacing human labour in various economic activities, In other words the computer as an extension of man's reasoning powers is also seen in some quarters as a real threat to man's own existence. This experience should be seriously taken into account in your deliberations.

Having said this, I wish now to turn my attention to the contribution that the computer can bring to developing countries.

Beginning with only limited specilized applications, informatics is now increasingly being called upon to perform common place functions in daily life, We find cheques, income tax returns, applications for jobs, magazine subscriptions and sometimes in certain countries even political opinions processed by computers. Computers can thus be an instrument of progress and prosperity benefiting people at large. The importance of computer technology has in fact been stressed as being just as vital as any other type of technology for economic development. The United Nations has said: 'Technology has an essential role to play in reducing the disparities that exist between developing and developed countries. Computers are essentially important in this context because so many computer applications have a direct bearing on some of the main facets of the development process and reflect certain aspects of the technology that has facilitated the growth of the economically advanced countries".

This seems to suggest that Computer technology can make significant contributions to our economic development and they even promise a greater contribution in the future. Despite these potentials many developing countries to date have been unable to tap this potential. Several factors seem to have been responsible for the poor success in the development of computer in many developing countries. These include, lack of national informatics policies, poor management participation, lack of trained Computer Specialists, under-utilisation and misuse of available computers, inadequate data problems and misleading expert advice. Unless developing countries are able to rid themselves of these problems, as well as the lop-sided market problem, it is going to be very difficult for us to be able to profit from the computer technology.

Ladies and Gentlemen, you have been given a broad mandate for this meeting and a very short time in which to carry it out. You are required to examine various issues related to the use of Computers and work out a way of starting regional cooperation among the various Computer centes that you represent. You are also required to make recommendations to UNESCO on its informatic, programme and how best this programme should be handled. During this time you will also be deliberating on the main informatics issues for developing countries and the role UNESCO should assume in shaping and following these developments, I am confident that you will accomplish this vital task with great success.

I am given to understnad that your group is made up of representatives from various African countries such as Sudan, Nigeria, Senegal, Burundi, Swaziland, Malawi, Zambia, Kenya, Uganda and Tanzania. With so many countries being represented you should make this the foundation for your future cooperation not only in the field of computers but also in your other professional fields. We should bear in mind that all African countries have a common aim in their development endeavours, and that is to raise African mankind from the abyss of under-development to a higher plane of well being, dignity and economic development. It is this unique characteristic that calls forth an even greater need to strengthen our cooperation in various fields.

In conclusion, I would like to express my sincere thanks to UNESCO and the Director of the Eastern and Southern African Management Institute for hosting such a gathering and to thank you all for coming to take part in the meeting. I wish you every success in your work.

I now declare your meeting officially open.

UNESCO'S ~~INFORMATION~~ INFORMATICS PROGRAMME IN THE 1979-80 BIENNIUM AND OUTLOOK FOR THE 1981-1983 TRIENNIUM

The importance of informatics was well brought into focus at the SPIN Conference organised jointly by Unesco and IBI and convened in Torremolinos, Spain, in 1978. It was recognized that informatics was going to bring about upheaval comparable to the industrial revolution and that those communities that failed to take advantage of its capabilities, among other things, might be the under-developed communities of the future.

Informatics revolution is being accelerated by the dramatic advances which have taken place in microelectronics technology during recent years. The invention of the transistor device in 1948 gave birth to the silicon monolithic integrated circuit in the 60's, then to the large scale integration (LSI) in the 70's. The first application of this in computer technology was the monolithic memory which displaced the computer core memory technology during the 70's. Then came the microprocessor in mass production also in the 70's. In addition, it was possible to put 1000 transistors on a chip and that increased to 100,000 transistors by 1980. It had been predicted that it would be possible to put 1,000,000 transistor on a single chip in production volume in the 80's. During this decade, therefore, mankind will find ways to write millions of signs (or circuits) in tiny solid state chips. This means a new mode of writing known as "miniaturized writing into solid state', which will be of equal importance as the invention of character set prining by Gutenberg. The impact of this on mankind from political, social, economical and technical points of view will be analogous to that of printing, because informatics, enhanced by development in microelectronics, is creating a brand new world for processing and transfer of information.

Already informatics as a discipline has had far reaching influences upon the whole of science and its applications affect all aspects of industrial production and management.

INFORMATICS PROGRAMME IN THE 1979-1980 BIENNIUM

In the light of the foreseable impact of informatics on mankind and the recommendations of the SPIN Conference, Unesco is implementing during the 1979-1980 biennium a programme of activities geared towards the development of informatics for the benefit of humanity. The following paragraphs give some illustration of the programme.

Advisory Group of Experts in Informatics

This is an ad hoc group made up of informatics specilaists both from developing and industrialized countries. It is constituted with a view to advising the Director-General on new modalities for Unesco's programme in informatics and prepare recommendations for consideration by the Executive Board and a future session of the General Conference.

Advice to Member States

Upon request, advices to Member States on policies and projects on informatics were undertaken. In 1979, a consultant mission was sent to China by Unesco to study the feasibility of organizing an informatics course in the University of Beijing. In early 1980, a Unesco consultants' mission went to Sudan to advice and study the feasibility of setting up a national computer centre. A mission to Gabon planned for 1980 was requested for advising on national policy in informatics.

Training in Informatics

Under contract with IFIP Technical Committee 3, elaboration of curriculum and training courses for informatics is going to be undertaken. The first draft of the curriculum prepared under the arrangement is presently available for discussion.

Under Participation Programme, requests from Member States for informatics assistance including fellowships, supply of experts and consultants are supported.

The international training courses in computer technology in Tokyo, Japan, continues to receive support. The course is roganised by the Asian Electronics Union and the Japanese Government admits candidates from developing countries. The Division of Scientific Research and Higher Education continues to support long-term training courses in informatics under its programme in postgraduate training courses in basic and environmental sciences.

Courses so supported include International Postgraduate Training Course in Computer Science, University of Lagos, Nigeria; International Postgraduate Training Course in Computer Management Studies, University of London, U.K.; International Postgraduate Training Course in Mathematics and Informatics applied to Research, University of Bucharest, Romania, Postgraduate Training Course in Applied Mathematics and Systems Analysis, Ain Shams University, Egypt.

Regional Collaboration

For regional collaboration, activities including five regional meetings of computer centre directors were organized. The objective of the meetings included initiation of mechanism for the establishment of cooperative networks of informatics institutions in each region.

The regional meeting of computer centre directors in Africa was planned for 14-18 April 1980 in Arusha, Tanzania. This meeting will have participants from both Francophone and Anglophone Africa.

The regional meeting of computer centre directors in South and Central Asia was held in Kathmandu, Nepal, from 29 October 1979 to 1 November 1980.

The meeting of computer centre directors in Latin/America/Carribean was held in Montevideo from 2.6 October 1979.

The regional meeting of Computer Centre Directors in Arab States as well as that of South East Asia were foreseen for later in 1980.

The regional meetings of computer centre directors which would have dealt with application of software exchange programmes and common maintenance efforts, were to be followed by a meeting of the rapporteurs of all the regional meetings at the Unesco headquarters in future. The meeting of rapporteurs will summarize main findings of the regional meetings, including computer software, hardware and a procurement services and prepare a set of recommendations.

In addition to the regional meetings of computer centre directors, two international seminars in Europe were supported. The International Seminar on "Information systems in public administration and their role in economic and social development" held in Chamrousse, France, from 17 to 23 June 1979 was supported. The Seminar was organized by the Data for Development International Association (DfD), a non-governmental organization whose headquarters is in Marseille, France.

The second programme receiving support is the international seminar on "Computer: Applications in Industry Management", which was held from 29 July to 17 August 1979. The seminar was organized by University of Patras, Patras, Greece. This seminar was planned to be updated and repeated from late August to early September 1980 again with the support of Unesco. The two seminars promoted the participation of people from developing countries.

Information on Informatics

A public information brochure on Unesco activities in the field of informatics will soon be published. Meant for general educated public readership, it provides a summary of various Unesco programmes and services in informatics, and gives indication of how to obtain such services.

Development of Training and Coordination of the Informatics Programme

In coordinating informatics programme, there is collaboration with international Non-Governmental Organizations (NGOs) in informatics including International Federation for Information Processing (IFIP) and the Five International Associations Coordinating Committee (FLACC). There was provision to support IFIP especially for the EUROIFIP 79 on Applied Information Technology, International Conference on Teleinformatics 79, and Human Choice and Computers. In addition, the establishment of an IFIP Committee on Informatics for Development was promoted. This group shows great promise for future interactions. The meeting of FLACC was also supported.

In the coordination activities with the United Nations system and IBI, there is participation in the ECOSOC and the computer meetings with the UN family. There is also active participation in the meetings of IBI Executive Council as well as the General Assembly and other coordinating meetings. Currently under study are ways and means of making IBI an effective instrument capable of contributing to carry out programmes which the development of informatics requires.

OUTLOOK FOR THE 1981-1983 TRIENNIUM

Following the SPIN recommendations and those of AGI meeting as well as the Regional Meetings of Computer Centre Directors, Unesco has planned to restructure its Informatics programme for 1981-1983 by concentrating in the following programme actions:

Manpower development and training

As pointed out by the SPIN Conference and the Advisory Group of Experts in Informatics (AGI), establishment of education and training programmes in informatics is crucial to alleviate the shortages of specialist personnel that widely exists in this fast expanding field, particularly acute in developing countries. Unesco will undertake activities to help the establishment of computer science programmes in tertiary education such as curriculum development and adaptation in particular cultrual environment. Postgraduate courses will be supported so as to train the informatics teachers. Short-term courses are essential to train professionals in a short time to meet urgent staff requirements and also for continuing education to keep abreast with the rapid technological advances. List of short-term training courses already planned include:

International training course in computer technology, Tokyo, Japan;

Computer Applications in Industry and Management, Patras, Greece;

Training course, Institut Africain d'informatique (IAI), Libreville, Gabon; and

Training course in informatics in China.

Unesco will organize jointly with a host institution or competent organization training courses and assist in forming training centres. A regional approach will be adopted so as to encourage centres of excellence in informatics education and training to develop for serving national and regional requirements. A fellowship programme will be evolved for young informaticians.

Education and training at more basic levels will be encouraged, with a particular emphasis on the education of the young in cooperation with the Education Sector.

Unesco will support informatics awareness programmes including appreciation of the social, cultural and economic implications and importance for development in cooperation with other sectors, including Social Sciences.

Effective Transfer and Adaptation of Technology

To improve the endogenous informatics capability in developing countries, joint research projects will be supported which will be undertaken between several national research institutions. The funds will be made available to provide regular exchanges of staff, and short visits required for the purpose of implementing a joint research programme.

With the help of public research and development centres and computer industry, projects in informatics applications aimed to support development will be identified and implemented in particular in the countries at the lowest tier of informatics development. Young computer professionals or new graduates of industrial countries will be encouraged to work in the field on these projects, supported by their own countries.

Recognizing the importance of rational utilization of the existing technology and the catalytic effect of such rational utilization towards development, seminars and workshops will be organized in developing countries, which will concentrate on the application of the advanced technology in informatics, such as microprocessors, computerized commercial and administrative data processing including distributive data processing. Participation of informaticians from all over each region will be supported. For each of the regional seminars, the best possible equipment will be made available in addition to the supply of excellent speakers.

Networks of cooperating institutions will be established in each region so as to achieve more concentration and effectiveness on actions in transfer of technology. Feasibility studies for the establishment of regional computer networks will be undertaken. (For programme and project execution, one informatics professional per region will be assigned, using Unesco or other resources).

Advice to Member States, upon request, on policies for informatics will be provided.

Enhancement of International Cooperation

To achieve tangible results and proper impact in the all pervasive field of informatics, it is essential that proper international cooperation exists to mobilize and concentrate the resources of international governmental and non-governmental organizations. Unesco's role in informatics will be made more visible to other Specialized United Nations Agencies so that projects of these agencies in informatics can be effectively coordinated within the framework of one comprehensive policy and in particular to UNDP and other funding agencies for execution of their projects. Cooperation in informatics with intergovernmental organizations will be pursued. Collaboration with the Intergovernmental Bureau for Informatics (IBI) will be maintained.

The competence and resources of relevant international non-governmental organizations (NGOs) such as IFIP, and others will be exploited so that their activities will be more oriented to the needs of developing countries. Unesco will organize jointly with relevant NGOs conferences, seminars, workshops, and short courses in developing countries. Regional informatics activities will be co-sponsored with NGOs.

Information on Informatics

A study will be undertaken to compile information on centres of information on informatics, education-training establishments and courses offered, research and development institutions and research opportunities in informatics as well as fellowships.

Direct action programme in microprocessors and minicomputers

The objective of this programme is to assist the introduction of microcomputer applications to developing countries with the objective to ensure that informatics gap is not widened by the very fast moving microprocessor technology.

A pilot project will be set up to establish microprocessor laboratories in countries especially in the initial stage of informatics development. The project will include the purchasing of the equipment, transportation, installation and training of staff. Following a three-year period, the host institution will take full charge of the installation. Initially, one installation will be placed at Unesco headquarters for training and evaluation purposes. It is expected that the direct action programme in microprocessors will serve as a model to be followed by others with help from extra budgetary resources.

Support will be given for those institutions in developing countries interested in establishing minicomputer centres, especially in teaching/research institutions. Consultancy services will be provided on request, to Member States for project specification to establish minicomputer centres, which will include the definition of needs and purpose, minicomputer systems hardware and software specifications, procurement, installation, management and staff aspects.

CONCLUSION

These illustrations of Unesco's activities in informatics are provided to demonstrate how this Regional Meeting of Computer Centre Directors in Africa relates to overall informatics programme of Unesco and to invite this audience to take advantage of the possibilities of the programme for the rational development of informatics in the region. It is hoped that participation in this meeting will enhance the benefits derivable from Unesco's activities including promotion of regional network of informatics institutions, manpower development, and professional as well as scientific interaction at international level through participation in the activities of international Non-Governmental Organizations (NGOs) such as IFIP in addition to taking active part in the IFIP Committee on Informatics for Development.

ACTIVITIES OF OAU/STRC IN INFORMATICS EDUCATION

The founding fathers of Organization of African Unity long saw the need for member states to cooperate in the areas of the scientific and technological education and development. This foresight was translated into action by the establishment of Scientific, Technical and Research Commission. Some of the main functions of the commission are:

i) To Foster Cooperation amongst members in areas of Scientific and Technical Research.

ii) To encourage exchange of scientific and technical knowledge.

iii) To encourage scietific research into African traditional methods with a view to developing them.

In order to achieve these objectives, the OAU through STRC sponsors various researches (e.g. Research into African Herbal Medicinal Practice) in higher institutions in members States, organizes Workshops on various scientific and technical topics. The organization also gives funds to support training of technical and scientific personnel which are needed for technological take-of in Africa.

In the field of informatic education and training the OAU/STRC is playing her part. The Commission now supports the international Post graduate Programme in Computer Sciences at the University of Lagos. The details of this programme I will now give:

INTERNATIONAL POST GRADUATE DIPLOMA IN COMPUTER SCIENCES AT THE UNIVERSITY OF LAGOS:

This programme is jointly sponsored by UNESCO, OAU/STRC and the University of Lagos.

The course was started in 1971 and since then it has produced an average of eight students by year. The students have come from African countries like Ghana, Ethiopia, Kenya, Uganda, Sudan, Nigeria, and Tanzania. Besides African countries we have had students from Turkey, Pakistan and India. For next session, we have an application from China.

The Course is designed to provide gradutates of Computer Sciences related discipline with advanced general post-graduate training in various topics of computer sciences with a view to prepare them to:-

1. Acquire professional status or
2. For post-graduate research in computer sciences.

The support of OAU/STRC for this programme include:

(i) Award of scholarships to some participants who are from member states of OAU.

(ii) Sponsoring of exchange programme between the Department of Computer Sciences at the University of Lagos and any other University or higher institutions belonging to any member state of OAU.

(iii) Sponsoring of Workshops, Seminars and Symposium on various topics in Informatics. Participants must be from member states of OAU.

This programme offers tremendous opportunities for member states of OAU to develop necessary manpower in informatics, especially those who do not have local training facilities.

Entry requirements is a good under-graduate degree in one of the following subjects: Mathematics, Physics, Engineering, Electronics, Statistics, Business Administration, Economics or Computer Science. Because of this rather broad range of subjects, member nations may not find it difficult to find suitable candidates.

Language of instruction is English, however, where there is the need, arrangements can be made for non English Speaking participants to undertake proficiency course in English.

If we in Africa will bridge the gap between us and the so called developed nations of the world, regional and continental collaboration and cooperation will be required. The brain powers dotted over different parts of Africa must be pulled together. Whether it is Computer Technology or any other form of technology we want to transfer (or steal) to Africa, continental effort will be required.

It is for this reason why OAU/STRC has supported financially and morally this conference. It is also for this reason that OAU/STRC has sent a representative.

NEED FOR COOPERATION

1. Development of computer technology is a capital intensive affair. The amount of money IBM alone devotes to research in computer technology is many times over the budgets of several developing countries. Again, since most of the developing countries have cheap labour, why should they engage in the capital intensive industry like computer technology?

2. For computer technology to take off in any country there must be in existence viable electronic industry and other allied industries.

3. There is the need to develop the necessary technical manpower.

4. There must exist market to absorb computers produced.

Inspite of these problems we must make progress. For, there is a similarity between the industrial revolution and the "computer revolution". Countries that we now call the developed countries today are those countries that paid proper attention to development of the industrial revolution. Countries that will be called developed, tomorrow will be those that are now paying proper attention to the development of computer technology. Besides, we know information is power. Therefore, because developed countries using resources of modern computers can now have greater abilities to store information on developing countries. Such information can be used against the interests of developing countries and maniputated to undermine their sovereignties. Thus computers are now by political weapons being controlled entirely by our former colonial masters! What a pity! It is because of this distinct possibility of use of misuse which side one, that we at this meeting must endeavour to work out the possible areas of cooperation for the development of informatic industry in Africa.

POSSIBLE AREAS OF CO-OPERATION

1. Hardware

2. Software

3. Net Work

4. Personnel Development Training and Education

CURRENT FEASIBLE AREAS OF CO-OPERATION

Because of reasons earlier stated namely high course, lack of allied electronic industries and non existence of capable manpower, individual countries cannot embark on Hardware Technology Development now. The best that can happen now is to have computer components made outside and assemble them locally. The danger in that arrangement is that local assembly plant will be the mercy of the parent Company outside of the region. Indeed it was reported during the Spain SPIN Conference that Brazil has such an assembly plant whose entire production processes are controlled via satelite by the parent company from US. There is the possibility that the US parent company may shut off the plant any time it wishes.

Network has been proposed as an area of cooperation, however, there are problems of:-

(i) Communication: (Telephone networks must first be established, and there is the need to standardi e dialling codes).

(ii) In compatibility of Existing Equipment

(iii) Trans Border Data Transmission - may lead to violation of sovereignity of member state.

All that is required for software development is brainpower. This is an area of feasible cooperation and no effort should be spared in achieving cooperation in development of software.

Other feasible and educations are:-

(i) Training and Education

(ii) Applications - During discussions I should elaborate on some of these points. In the meantime on behalf of OAU/STRC I wish the Conference every success in its deliberations.

APPLICATION OF INFORMATICS IN ZAMBIA

MR, M.N.J. LAMBERT

1. Introduction:

1.1 Zambia is one of the most urbanised of the African Nations. This is due mainly to the predominant industry of copper mining and the resultant build up of towns around the mining areas. Approximately 33% of Zambia's 5½ million population live in Cities mainly around Lusaka the Capital or in one of the Copperbelt towns.

1.2 I have no detailed history of computing in Zambia available to me, however, I understand that the first IBM 370's in Central Africa were installed at the headquarters of the two large mining groupsNCCM AND RCM.

1.3 This report should be considered as a snap shot of current computing in Zambia which I hope will provoke some discussion to the mutual benefit of the course members.

2. The Machines and Staffing:

2.1 The following equipment is utilised in Zambia:

IBM	ICL	BURROUGHS	
370/158 *2	2904	Small Busines *4	
370/145	2903 *7		
370/135 *2	1903		
370/125	1901 *4		
370/115			
System 3 *13			
Totals: 20	13	4	37

The following breakdowns may be of interest also.

Region:		Sector	
Lusaka	19	Central Government	3
Kabwe	1	Local Government	4
Copperbelt	17	Parastatal	15
		Private	15
Total	37	Total:	37

2.2 There are around 1,000 Data Processing Staff employed in Zambia.

The majority of those are Zambians but there are still a large number of expatriates working in Zambia on contract, drawn mainly from the United Kingdom and India. These expatriates generally occupy managerial or senior analyst positions. This is of course not an ideal situation and the number of expatriate staff recruited is unlikely to fall dramatically in the near future due to the likely increase in the number of installations in Zambia.

3. The Manufacturers:

3.1 The major manufacturers in Zambia are IBM and ICL. IBM operates as a branch of IBM WTC and ICL is a limited Zambian Company.

3.2 IBM tend to have the monopoly of the large installations in the country but recently ICL have been very active in marketing their 2903 range.

IBM have not announced any new range in Zambia for some time. They intend discontnuing all ETP/FTP Agreements after 1980 and are unwilling to offer any new equipment on rental terms. ICL, at the time of writing continue to give the ofline of rent or purchase.

4. Communications:

As far as I am aware there are 4 users who use communications equipment in Zambia. Two of the users actually transmit data over a distance of some 350 kilometres using dedicated lines and I understand that they are satisfied with the percentage of down time recorded. However, the other users are exremely dissatisfied with the performance of their lines and indeed one of the users at one time seriously considered discontinuing all data communications work.

Racal modems, supplied locally by International Aeradio, are used in preference to those supplied by the mainframe manufacturers by at least 3 of the users.

5. Applications:

I reproduce here a table from a report presented by Professor R.J.P. Scott of the University of Nairobi which will not have changed dramatically since it was compiled.

In 1978 the author found the following breakdown:

APPLICATIONS	NO. OF INSTALLATIONS	%
General/Debtor/Creditor Leges	11	92
Stock Control	11	92
Salaries	10	83
Invoices	10	83
Statistical Tables	9	75
Sales Statistics	9	75
Personnel Records	8	67
Assets Register	8	67
National Provident Fund	7	59
Pension Payments	7	59
Cheques Payments	6	50
Order Processing	6	50
Hire Purchase/Loan Accounts	5	42
Statistical Regressions	4	33
Savings and Bank Accounts	4	33
Utility Billing	4	33

One individual system which may be of interest is a Grade VII Examination system based on the use of an Optical Mark Reader by the Zambian Ministry of Finance's installation.

I believe that this is the only OMR in use in Central and East Africa.

6. Education:

6.1 There are four main methods used to train computer staff other than in house training.

These are, the Programming Course at the Zambian Institute of Technology (ZIT), a one year course at the University of Zambia (UNZA), Manufacturers Courses in Zambia and abroad, and long term courses outside Zambia.

It should also be noted here that the Mining Industry Manpower Service Unit (MIMSU) have a very advanced level of in-house training which includes training of Computer Trainees.

6.2 The Computer Programmers Course at the Zambian Institute of Technology (which incidentally gives exemption from Parts I and II of the Institute of Data Processing Management's professional examinations) is of an 18 month duration and covers the following subjects:-

Introduction to Electronic Data Processing	100 hours
Computer Languages R.P.G. 190 hours) Cobol	
260 hours	450 hours
Computer Operating	100 hours
Communication Skills	220 hours
Mathematics and Commercial Arithmetic	220 hours
Accounting	320 hours
Business Organisation	165 hours
Political Education	50 hours
Total:	1,625 hours

Terms:- 1,2,3,5 and
(Term 4 - Industrial Break)

Representatives from all sectors of the Industry sit on a Curriculum Development Committee.

Graduates from this course are employed throghout installations in Zambia.

6.3 The one year course at the University of Zambia is scientifically based but graduates who have attended this course have also entered the data processing profession field with some success. The course includes introduction to computers, flowcharting, probability and statistics, introduction to computer languages, fortran programming and application of fortran to numerical analysis.

6.4 Both major manufacturers have organized locally run courses in the past and it is hoped that the number of these offered will increase during 1980. The need to send staff abroad to manufacturers courses is only necessary (in my view) for specialists such as Systems Programmers.

6.5 Many Zambians have been sponsored to attend courses abroad. Speaking from personal experience the most successful results have been obtained from the HND in Data Processing run at army colleges on the United Kingdom. This is an excellent broad based course with great relevance to the work those sponsored will be involved in upon their return. I understand that the mines also sponsor trainees on degree courses in the United Kingdom.

7. User Groups:

7.1 There is an active ICL users group which meets on a regular basis.

7.2 During the latter part of 1979 and the early part of this year I took the initiative in setting up an IBM users Group. There have been two meetings of the group during 1980 the latter of which was attended by IBM representatives and a userful interchange took place. The next meeting is arranged for early May, 1980.

8. The Computer Society of Zambia:

This is yet another organisation which has been formed recently. A national executive has been elected as have two regional executives (one for Lusaka and the other for the Copperbelt). Great enthusiasm has been shown by the membership so far which numbers well over 100, and a vigorous programme of activities has been drawn up for the year.

9. The Computer Utilisation Committee:

9.1 This is a staturoty government body chaired by the Deputy Secretary to the Cabinet whose members are drawn from Central Government, Local Government, and Parastatal and include both Computer professionals and laymen. All Government and Parastatal Organisations must submit detailed plans for new or altered computer equipment for approval and all current installations in these sectors must submit annual reports on the past year;s activities of their installations.

9.2 A sub-Committee which is looking into conditions of service for computer personnel in Zambia has recently been reconstituted.

10 International Organisations:

Very few organisations in Zambia belong to GUIDE or COMMON, the international user groups. I personally feel that, just as great benefit can be derived from an interchange of ideas at national level, so too can mutually beneficial exchanges take place internationally, and in particular at Meetings on a regional basis such as this arranged in Arusha.

11. Conclusions:

Data Processing in Zambia, as I suspect in most developing countries, is beset by massive problems. Some of these are problems which are common to developed countries but are merely exaggerated such as staff shortages. Others are unique to developing countries e.g. lack of foreign exchange, disappointments with expatriate staff, unavailability of latest machine models.

However, as indigenous expertise is built up I am sure that many of these problems will disappear. Certainly Zambia has many fine data processing professionals and the long term picture is potentially bright.

2. COMPUTERS IN MALAWI

P.E. CHILAMBE

1. INTRODUCTION

Although data processing in Malawi started with the use of electro-mechanical office equipment, such as ledger-posting machines, the employment of electronic data processing mainframes commenced around the 60s with the acquisition of computers by the Malawi and by the Portland Cement Company of Malawi and by the Malawi Government. The latter in about 1966 to process the first independent Malawi population census. These installations were comprised of ICL 1901s and Univac 1004 at Malawi Railways and Portland Cement during the same period. The Malawi Certificate of Education and Testing Board (MCE & TB) followed about the same period with a Hewlett Packard.

2. PRESENT SITUATION

Up till 1976 the four installations mentioned above appeared to have satisfied the needs of the computing community. The greater percentage of management was apparently contencted with manual systems, supplemented with what such small equipment as Burroughs L5000 could provide.

However, during the period 1978 to-date, six new mainframes have been installed. One in a Government Ministry, two in Statutory bodies and three in private organisations; thereby bringing in new job opportunities. It is also envisaged that some three more installations might spring up before the close of this year. See Appendix 1 for a list of installations. Of all these installations only three offer bureau services. These are:

The Government Computer Centre
The Malawi Railways Ltd.
The Portland Cement Company of Malawi Ltd.

3. APPLICATIONS

Almost without exception financial applications are the most predominant. However, at the Government Computer Centre statistical applications like Foreign Trade and Tourism, engage about a quarter of the data processing resources utilisation (not) to mention the current one-off population Census System which takes a full shift to seven hours every day.

Needless to say the sudden growth in equipment acquisition during the last two years indicates that available bureau services became saturated, in addition to the fact that an increasing number of organisations has tended to look to the computer more than ever before. Hence Computer applications have developed rapidly over the past two-three years.

The list at appendix II, though far from being exhaustive, serves to show the picture.

4. GOVERNMENT APPLICATIONS AND POLICY

The Malawi Government is the largest user of electronic data processing facilities as the short-listed list of system shows. The role of Population Census data and Foreign Trade statistics is of no doubtful importance to the formulation of Government Policy. Two system falling under the same category, currently under development, are the Public Debt for obvious purposes, and the Personnel Information system for manpower planning.

Government policy on equipment acquisition is flexible. However, in general the Government encourages the maximum utilisation of over-all available resources before new acquisitions are considered; of course bearing in mind special circumstances surrounding financial institutions such as banks.

5. COMMUNICATIONS

1979 has seen the introduction of communications processing with the Commercial Bank of Malawi and Manica Mann George Ltd. taking the lead in this area. The Malawi Government Computer Centre, though heavily loaded with batch processing systems, is enhancing its computer system to accommodate communications processing this year.

The Department of Posts and Telecommunications leases telephone lines on dedicated use basis. The Department also reserves the right of providing modems of its own approval. The question of dial-up system within a shared network is the next stage in the development of communications processing.

See Appendix 111 for tariffs charged by the Postmaster General.

With the exception of the HP of the MCE and Testing Board in Zambia all the mainframes are located in Blantyre. Now with the fact developement of the new Capital City in Lilongwe and therefore the consequent high interaction between the two cities, one tends to foresee a considerable development in communications processing, as organisations move their head office to the new Capital.

6. TRAINING

The shortage for trained manpower has become more accentuated with the recent growth in the number of installations. It therefore came as no surprise that the new installations have had to poach from the old establishments in order to form a nucleus of experienced data processing personnel upon which to build their data processing departments. An inevitable consequence. This also explains the significant role played by Consultancy companies in the development of new applications for several organizations.

This brings the point that formal training facilities are not available in the country.

However, equipment suppliers do conduct courses associated with their equipment mainly as part of the initial installation setting-up exercise. These courses, as might be expected, cover mostly operations and programming. However, ICL have since last year been offering courses to the public (of course at a fee) mostly appreciation type of courses and programming languages.

Therefore there is a haeavy reliance on overseas courses in the higher fields of data processing subjects, such as Systems Analysis where the shortage of manpower is most acute. Needless to say few organisations can afford such courses where scarce external sponsorships are almost always the only resort.

Some local efforts in formal training is only available at the University Colleges where the subject is taught simply as a tool of major disciplines and not as a profession in its own right.

7. INTEREST GROUPS

There are two groups in Malawi. The oldest one is the Computer Systems Development Committee, a Government body with advisory functions on data processing matters.

The second body is the Computer Society of Malawi. This society was set up effectively three years ago. Young as it is, the society is only capable of organising public lecturees in data processing subjects. It has however formed an Education Committee and this committee is currently exploring means of introducing courses at the Malawi Polytechnic.

8. CONCLUSION

You will no doubt have observed that the paper is not aimed at covering the small office systems of which there are plenty in Malawi. At the same time whilst the number of main-frames and perhaps their sizes also might be relatively small compared to those of other participating countries in this region of Africa, it could reasonably be predicted that the sudden surge of interest in electronic data processing has made a positive impact in management thinking, and data processing will therefore continue to take an increasing share in Malawi's economic activities. After all, small or big computer users share a lot of common fundamental interests.

P.E. Chilambe
Chief Data Processing Officer
Malawi Government

APPENDIX 1

ORGANISATION	COMPUTER MODEL	STAFF SIZE
1. Government Computer Centre	ICL 2903	92
2. Malawi Railways Ltd.	ICL 2903 (replacing ICL 1901s)	54
3. Portland Cement Co. Ltd.	ICL 1901 (old installation)	36
4. M.C.E. and Testing Board	HP (replacing HP2114B)	12
5. Agricultural Development and Marketing Corporation (ADMARC)	ICL 2903 (new installation)	10
6. Commercial Bank of Malawi	NCR 8270 (new installation)	7
7. LONRHO	ICL 2903 (new installation)	16
8. Manica Mann George Ltd.	B 800 (new installation)	11

Only the first three installation provide bureau services.

APPENDIX II

INSTALLATION	APPLICATIONS
1. Government Computer Centre	Government Payroll
	Government Accounts
	Foreign Trade
	Pensions
	Advances
	Tourism
	Census
	Business Information Register
	Police Road Accidents
	Police Crime
	Police Dangerous Drugs
	Police Traffic Offences
	Police Firearms
	Skill Survey (Labour Statistics)
	Meteorology
	Health (Out Patients)
	Agro-Economic Survey
	Market Survey
	Post Office Savings Bank
	Post Office Telephone Accounts
	Post Office Money Order
	Government Central Stores
	Plant & Vehicle Hire Organisation's
	Debtors Ledger (Oil Company of Malawi)
	Stock Control (B & C. Ltd.)

APPENDIX II (Cont.)

INSTALLATION	APPLICATIONS
2. Malawi Railways Ltd.	Revenue Accounting(Rate Checking Sales Ledger) Expenditure Accounting (Payroll, Creditors) Budgetary Control, General Ledger, Wagon Hire Interchange, Transport and Personnel Statistics, Electricity Billing (for ESCOM), Accounting and Stock Control (for various Customers)
3. Portland Cement Company Ltd.	All Accounting Applications (Debtors, Stores etc.) Ticket Clearance (for Air Malawi), Rates System (for Blantyre City, Fluid Flow Analysis
4. M.C.E. and Testing Board	Public Examinations, Socio-Economic Survey (for LLDP) Aptitude Test
5. ADMARC	Cash Imprest for Produce Markets, Other Accounting applications (General Ledger; Sales etc.)
6. Commercial Bank of Malawi	Banking Applications
7. LONRHO	Payroll, Other Accounting Applications (under development)
8. Manica Mann George Ltd.	Clearance Agency Applications Other Accounting Applications (General Ledger etc.)

APPENDIX III

TARIFFS ON INTRODUCTION OF DATA TRANSMISSION FACILITIES

A. Rentals		Per Annum
1. Leased Circuit:	Blantyre - Chileka (16km)	K600 (£330)
	Blantyre - Zomba (64km)	K3,000 (£1,650)
	Blantyre - Lilongwe (384km)	K6,000 (£3,300)
	Blantyre - Mangochi (192km) etc.	K4,500 (£2,475)
Plus two local ends @ K12.00 per ½ Kilometre (£6.60)		
2. Modems, each end, 2 x K648 (356)		K1,296 (£712)
b. Installation Fee		PER SERVICE RENDERED
1. Leased Circuit		K100 (£55)
Plus two local ends @ K12.50 per ½ Kilometre (£7.00)		
2. Modems, each end 2 x K75 (£41.00)		K150 (£82)

3. APPLICATION OF ~~INFORMATION~~ INFORMATICS IN NIGERIA

DR. OLAYIDE ADASS

EDUCATION AND TRAINING

The first serious training in Data Processing was organised by IBM in co-operation with the University of Ibadan from 1962-64. Participants were invited from all over Africa. This marked the first serious attempt to market their computer in Africa.

Since this humble beginning, informatics education has grown steadily in Nigeria and it is still growing. I shall describe in details the various courses that are available at the University of Lagos.

Nigerian Universities that have courses in Computer Science are:

1. University of Ibadan, Ibadan. (Undergraduate and Postgraduate.)
2. University of Lagos, Lagos (Short term, undergraduate Postgraduate)
3. University of Ife, Ileife: (Undergraduate, Postgraduate)
4. University of Nigeria, Nsukka (Undergraduate, Postgraduate)
5. Ahanadu Bells University, Zaria (Undergraduate, Postgraduate)
6. University of Benin, Benin, (Undergraduates (as part of mathematics programme)

THE PROGRAMME AT LAGOS

The present Department of Computer Sciences was started as the Computer Laboratory in May 1965, when the University rented an IBM 1620 (20K) computer system with some peripheral equipment; the main ideas being then to introduce to staff high-speed digital computing, and use the facility to end University administration.

By May 1967, the activities of the Laboratory had become so established and computing needs of the country had become sufficently mainfest to enable the University to convert the Laboratory to the Institute of Computer Sciences an autonomous academic unit within the University structure with the following objectives:

1. To engage in an active programme of education in Computer Sciences and training in the use of Computers.

2. To engage in an active programme of research in Computer Sciences.

3. To provide computing servies to the University and other organisations outside the University (Government, Industry and Commerce)

In order to achieve these ends the Institute of Computer Sciences was offering courses for:-

(i) Undergraduate students

(ii) Post-graduate students

(iii) Faculty Members and people from outside the University

The Institute achieved the status of a "School" with its own Board of Studies and Dean in 1969. Up to October 1971, the Institute of Computer Sciences was Engaged in

(i) Performing data processing and consulting services for the University Administration, University Academic and Technical Departments, Government Ministries, Public Corporations as well as Industrial and Business Organisation in the private sector of the national economy;

(ii) developing courses that form integral parts of undergraduate degrees in Mathematics, Engineering, Administration and Medicine; and

(iii) developing extension courses in Computer Programming for personnel from Government Departments, Business and Industry.

Between November 1969 and June 1973. The computing needs of the University and that of the country had grown enormously that the University found it necessary to consitute the academic activities of Extension Programmes of the Institute of Computer Sciences into the Department of Computer Sciences. The Institute's digital computing system an IBM 370/145 formed the centrally organized and centrally contolled University Computer Centre.

THE TEACHING PROGRAMME

The Department's teaching programme consists:-

1. Extension Programmes

These are short intensive evening courses with aim of producing middle/lower level manpower for the Computer Industry in the country.

They consists of two courses

Course I. Introduction to Electronic Data Processing

Course II. Computer Programming: (Efforts are made to cover minimum of two high level languages - one suitable for Scientific environment and the other for Business environment.)

Minimum Entry Qualification;

Pass in W.A.S.C.E. (or its equivalent) in at least five subjects at credit level including English and Mathematics. Such a candidate must have reasonable computing experience.

This is the entry requirement for Course (1). To enter into Course (11), a candidate must have successfully completed course (1) and or have an equivalent qualifications.

DURATION

Each course lasts for 90 hours made of lectures and practicals. The practicals consist of programming. The present syllabus has been designed by a panel of Specialists drawn from Government, Business and Private Computer Installations. The idea behind this is to ensure that products of these courses meet requirements of Computer Professionals and Computer Installations in the country.

SERVICE COURSES

Courses which form part of degree programmes in Business Administration (MBA) Engineering, Medicine Economics, Psychology and Sociology are run.

UNDERGRADUATE PROGRAMMES

A three year B.Sc. combined (Joint) honours degree programme in which computer sciences may be offered with Mathematics or Statistics or Chemistry as a second subject was initiated in 1972. Taking the advantage of the course Unit Systems introduced in the Faculty in October 1974; this programmes was redesigned in an "Open ended" manner to permit the inclusion of Business Administration as a second subject last year. The board of studies approved a proposal to make it possible for students to offer Economics along with Computer Sciences.

A three year B.Sc. special (Single) honours degree programme initiated in October 1975 permits specialization in one of the three areas of Computer Sciences.

1. Computing Systems (Software - Hardware)

2. Systems Science and Operations Research

3. Computational Analysis and Application with a Minor being offered in either of the other areas.

The structure of Special Honours course is such that most of the mathematics necessary for Computer Science at undergraduate level are taught in the first year. The nature of jobs that graduates do and needs of the country demand that emphasis should be laid on programming and applications. The Department takes great pains to ensure that the students meet these requirements.

POSTGRADUATE DEGREE PROGRAMMES

Courses and Research Programmes leading to the Master of Science Degree and Doctor of Philosophy degrees in areas such as:-

(i) Computing Systems (Hardware, Software and Computing theory)

(ii) Systems Science and Operations Research

(iii) Computational Analysis and Applications

THE INTERNATIONAL POSTGRADUATE DIPLOMA IN COMPUTER SCIENCES

This course was initiated in 1971. The course is designed to provide graduates of Computer Sciences or Computer Science related disciplines, with an advanced general post-graduate training in various topics of Computer Sciences with a view to prepare them.

i) to acquire professional status or

ii) for post-graduate research in Computer Sciences

Knowledge of industrial techniques of Computer Sciences and Technology is imparted through assignation of participants to projects organized in co-operation with Computer installations in the Lagos area.

SPONSORSHIP

This course is jointly sponsored by:

i) UNESCO

ii) OAU through its Scientific, Technical and Research Commission.

iii) The University of Lagos

STRUCTURES OF PROGRAMMES IN OTHER NIGERIAN UNIVERSITIES

The structures of programmes in other Nigerian Universities are similar to their corresponding ones in the University of Lagos, and hence I will not discuss them here.

OTHER INSTITUTIONS

a) Besides the University, the Polytechnic, Ibadan will start to offer courses in Computer Science leading to award of HND.

b) A number of private organization do offer training in Computer Operation, Key Punching and Data Processing. Some of them prepare students for Part I and Part II of Institute of Data Processing Examinations. By and large these private organizations do exploit innocent citizens and the need for Government to control their activities.

c) Manufacturers do provide training facilities on Operations, System Analysis etc.

COMPUTER PROCUREMENT

There are over 200 main-frame computers in Nigeria at present. The 200 Computers do not include minis. Main manufacturers in Nigeria now are: ICL, IBM, Control Data, Digital NCR, Data General. Most of them either have 60% Nigerian participation as required by law, or they are being represented in Nigeria by Nigeria Companies. For instance DPMS a Nigerian Company is now maintaining IBM computers in Nigeria since IBM packed out of the country because of their inability or refusal to comply with government regulation that all Companies operating in the country must have 60% Nigerian participation.

JKK, another Nigeria Company, represents Data General while Data Sciences represents Digital Equipment.

COMMUNICATIONS FACILITIES

All of the Computers in Nigeria at present operate batch processing systems. There is no network of any sort principally because of lack of adequate infracture to support networks. However, with enormous amount of effort the government is making to develop telephone networks, it is hoped that computer networks will gradually evolve. Meanwhile, Directors of Computer Centres in various Universities are making joint effort to persuade the government to allocate special lines on the existing telephone networks available to them to develop a Computer Network which will enable them to share resources. Also, shell Development linked Warri to Port Harcourt in a leased circuit. They are the only Company with that communication facility in the Country.

COMPUTER APPLICATIONS

a) The Computers in the Universities are used for research, teaching for administration. There are various applications; Medical Applications, Engineering Application; Scientific Applications, Business and Social Applications. Support Services given to the University Administration include: Payroll, Student Records, Personnel, Admission Applications.

b) Computer in Government and Quasi Government establishments are used for specific applications needed in the establishments. Thus for instance, the computer at National Electric Power Authority is used for Billing, Power System Development and other activities of the authority requiring computerization. West African Examination Council uses her computer for processing examination results, Research in Education measurements.

c) Computers in Business and Private Organizations are used for usual Business Applications: Billing Stock control Personnel, Account Receivable, Account Payable, Forecasting, Exploration etc.

It must be said here that the computers in Nigeria are grossly under utilized due to frequent power cuts, maintenance problems and staffing problems. Staffing problems are more pronounced in Government and Quasi government computer installations because of wide disparity between salary paid in any government and that paid by private organizations.

GOVERNMENT POLICY

Up till 1st January, 1972, there was no clear government policy on Computer. There was a computer Utilization Committee whose main task was to monitor computer utilization in the country. However, the committee had no real impact. In 1978 a Central Committee was set under the Chairmanship of Director of Federal Office of Statistics. Its main function is to scrutinize applications for importations of computer. Except the committee approves any applications for importation of computer, the intending importer will not be granted permit to import. This became necessary as a result of rather indiscriminate importation of computers even though it was apparent that those already installed were (and are still not) being fully utilized.

Now the new administration in the country has established a Ministry of Science and Technology and it is expected that this Ministry will help evolve a national policy on development of Computer Technology in the country as part of overall programme for technological development for the country.

COMPUTER ASSOCIATIONS AND USER GROUPS

A newly Computer Association of Nigeria (CAN) was lunched on the 11th April, 1980. The objectives of the Associations are:

1. To promote training of Computer Scientists. Engineers and Professionals.

2. To actively encourage research in the advancement of Computer Science, Technology Practice and disseminate results of Scientific Works carried out both in the Industry and academic institutions.

3. To promote the inter-change of information about sciences and arts of information processing among specilaists and the public.

4. To develop competence and encourage integrity in individuals engaged in the practice of computing, and to uphold the code of conduct and code of practice of the Association.

5. To promote and protect the professional interests of its members and to advise members, governments and other computer authorities on matters affecting the computing profession.

6. To co-operate with such similar professional organisations throughtout the world, and to render or reciprocate such services as beneficial and consistent with aims and objectives of the Associations.

UNESCO, through IFIP is requesting the association to organize a Conference in November 1980 in Applications of Micro processors for Development.

There is NACOSS - Nigerian Association of Computer Science students whose aims are similar to those of CAN.

USERS GROUP

The IBM Users Group came into being when IBM were about to pack out of Nigeria. The aim was to enable the group discuss the implications of the pulling out of IBM from Nigeria. The group still exists but because of the fact that there are no immediate problems, the group does not meet as frequently as it used to do. There is also the Directors of Computer Centres in Nigerian Universities which meet regularly to share experience.

REGIONAL MEETING OF COMPUTER CENTRE DIRECTORS IN AFRICA
ARUSHA, TANZANIA

REPORT ON COMPUTER SITUATION IN UGANDA

BY

PROF. P.E. MUGAMBI

Department of Mathematics

Makerere University

1. INTRODUCTION

The computer situation in Uganda is a tale of stagnation, neglect, obsolesence and mismanagement which is a consequence of ravages of the Amin regime.

2. EDUCATION AND TRAINING

There exists no formal training leading to a recognisable qualification in computing. Prior to 1970 some personnel were trained at institutions in Nigeria and United States of America. The majority of personnel, however, have had only on-the-job with the Uganda Computer Services, Ministry of Finance or with the Computer Centre at Makerere University. The Computer Centre at the University is managed by the Department of Mathematics through which courses are offered in computing, as part of undergraduate degree courses. It has always been the objective of the University to set up a separate department or Institute of Computer Science but this has not yet materialised for serious lack of qualified staff and other facilities. The other mode of training has been by personnel attending short-term courses of say one month's duration that are offered by vendors such as ICL and only lead to a certificate attendance. Consequently existing personnel seriously lack training in the recent developments in computing.

3. EQUIPMENT

Most of the existing equipment dates from the late sixties and is of limited capabilities. Attempts to acquire more modern equipment failed because of lack of funds and the erosion of Uganda's international image during Amin's regime. If the present government cannot provide funds for replacement of the equipment we may have to appeal to friendly countries and international donor agencies to assist.

Below is a list of existing equipment

Machines	Size	Number	Location
IBM 360/30	32K Bytes	1	Uganda Computer Services (UCS)
ICL 1902A	16K Words	1	Uganda Electricity Board (UEB)
ICL 1901A	16K Words	1	Makerere University
ICL 1901A	8K Words	1	Social Security Fund
ICL 2903/30	20K Words	1	Ministry of Education
WANG 2200	32K Bytes	1	Hydromet Project

There have been many difficulties with maintenance because the IBM or ICL qualified personnel would not come to Uganda frequently enough to service the machines during the Amin's regime. We have had to rely on inexperienced and not so well trained local technicians to maintain the equipment. Supplies of Research activities having been so curt ailed in recent years is reflected in the underutilisation of the existing equipment. Below are average figures indicating the load of work at some centres:

Centre	Hrs/Month	Monthly % usage
Makerere University	165	22.9
UCS	394	57.7
UEB	285	39.6

4. COMMUNICATION FACILITIES

In the past census data has been processed at the Uganda Computer services, but the recent census of 1980 will have to be processed outside Uganda because the IBM 360/30 has not at all been well maintained. Apart from this the UCS provide Services for payroll, budget preparation etc for the government. The centre at the University has mainly provided teaching services although some researchers in government ministries such as forestry and agriculture have in past employed its services. Nothing has been accomplished in computerising the library records or student and staff records at the University for lack of staff. The equipment at the Ministry of Education has been mainly used to process examination result while that at the UEB has been used for payroll, billing etc. The Hydromet Project is an international UN supported project to monitor the waters of the Nile and use a computer to analyse data on rainfall etc. There is very little use of computers in commerce and industry, I only know of Shell and BP who use the University computer to manage their operations.

6. GOVERNMENT POLICY

In July 1977 government set up a committee of experts with terms of reference:

1. to identify institutions or organizations with need computer services.
2. to identify the work load to be computerised
3. identify personnel required
4. assess existing computers - load etc.
5. advise on what computers will be required
6. assess merits demerits of renting v.s. purchasing and advise accordingly
7. advise on procedures to be followed when an organization is to acquire a computer
8. advise on optimising use of data processing recources.

The experts in the main recommended that users be grouped into

(i) Educational Institutions

(ii) Government Institutions

(iii) Commercial Institutions

Each group would then be provided with suitable computer Services that are managed centrally. No action has been taken on these recommendations to date.

APPLICATION OF INFORMATICS IN KENYA

PROFESSOR R.J.P. SCOTT

1. EDUCATION AND TRAINING

1.1 EDUCATION

There is one National University, the University of Nairobi although a second one is planned during the development plan 1979/83 period. The University of Nairobi established a computing centre as a department in the Faculty of [illegible] in 1969. Since that time the computing facilities have moved to new premises whilst an independent Institute of Computer Science has been established. The Institute of Computer Science provides both academic courses and computer services to the entire university. Last year a new multi-access computer was donated to the University which comprises 8 remote processors, 26 visual dispaly units and 19 remote printers. Approximately 900 undergraduate and post-graduate students are given service courses on computer science/information processing subjects. Compulsory courses are given to all undergraduates in the Faculties of Commerce, Engineering and Science using interactive BASIC Optional second tier courses are given including second languages FORTRAN, COBOL, and some systems techniques. Other students also receive courses, these are from Agriculture, Arts, Architecture Design and Development, Education and Business Administration. At the moment no degree or joint degree in computing subjects is available.

From October 1980 a post-graduate diploma in computer systems will be mounted as a 12 month course for 12 students. It is apparent that this course will be over-subscribed. The Institute has proposed to provide for regional participation from 1981.

1.2 TRAINING

Little formal training is available apart from extramural evening courses run by the University of Nairobi. The Institute of Computer Science has proposed that a frame-work for advanced courses on data processing subjects be set up on a national basis. Each member of academic staff is expected to present at least one workshop during a year. Upto three visiting lecturers will be funded to run workshops each year. A system analysis training course is under consideration to be funded by an International Aid Agency. Earlier this year the CDG from West Germany held a three day workshop to formulate priority areas in data processing training in Kenya. The final report is not yet published.

The Starehe Boys Centre has started an experimental computer training project for final year EACE level school children. This project is receiving good support from industry.

1.3 PRIVATE TRAINING

Data preparation, operations, and COBOL programming courses are available by a number of private training firms. Concern is expressed that these courses do not provide training for the requirements of industry.

1.4 MANUFACTURERS/VENDORS TRAINING

A considerable number of courses are available particularly related to equipment being marketed. One manufacturer, ICL has a full-time training staff to run a regional training centre in Nairobi.

1.5 CERTIFICATION

Manufacturers provide certificates of attendance. University courses are assessed as part of the normal degree courses. Private training firm provide graded certificates of proficiency of unknown standards.

2. COMPUTER EQUIPMENT PROCUREMENT

2.1 MANUFACTURERS RANGES

The following manufacturers products are available:- Burroughs, Hewlett Packard, IBM, ICL, NCR, Olivetti, and Wang. Two special purpose computers are supplied by Fujitsu and Elliot Automation but are maintained from overseas. One company Comprite is assembling its own CRT computer, the first of which is installed as an on-line spare parts system.

2.2 NUMBER OF COMPUTERS

Burroughs: B800, B3500 91), E5000 ( ), L9000 ( )	3
Hewlett Packard:	1
IBM: 370 (1), System 3(10), System 38(2)	12
ICL: 2950 (1), 2904(5), 2903(7), 1900(4) 1500 ( ), System 10	17
NCR:8250 (3), 399/499 ( )	3
Fujitsu:	1
Wang:	14
Olivetti: Audit 5, 6, 7 ( )	10
Elliot Automation:	1
Computer: CR7 (1)	1
TOTAL	62

These numbers include a considerable number of programmed visible record machines supplied by Burroughs, NCR and Olivetti. These are likely mini computer installations of the future. An interesting observation is the introduction in 1978 of the Wang computer which now has a significant share of the market. A number of customers have key edit systems and remote terminals that use large central computers for their processing. Most of these installations are situated in Nairobi. The new product being introduced is the computer system dedicated to word processing which opens up new sectors of application.

3. COMMUNICATIONS FACILITIES

3.1 LEASED LINES

Direct lines are available from the Kenya Posts and Telecommunications Corporation but their availability cannot be guaranteed at all places although considerable expansion of facilities is currently underway.

3.2 MODEMS

Modems are available from the Kenya Posts and Telecommunications Corporation but some delay has been experienced with the award of the last tender which closed in May 1979. A voice communication facility is available for data modems.

3.3 DIAL-UP

Dial-up facilities are not yet available but a joint research project with K.P. and T.C. is proposed to experiment with this technique using the University telephone network and computer installation.

3.4 SATELLITE LINKS

No satellite links are used at present. Work is starting to analyse locally the Data produced by Landsat Satellite on magnetic tape to be recorded at a site within Kenya.

3.5 NATIONAL LINKING OF COMPUTERS

To date no machines of different manufacturer have been linked. The following organizations use remote terminals connected to their central computer:-

Kenya Railways
Kenya Government
Data Centre Bureau
Industrial and Commercial Development Corporation
University of Nairobi

4. COMPUTER APPLICATIONS SPECIFICALLY FOR DEVELOPMENT

a) Census processing is undertaken every five years at the Government Computer Centre.

b) No library computerization has been started apart from a periodical union list.

c) Schools examination processed include grade VII, KJSE (Form 2), EACE, and Higher School Certificate.

5. GOVERNMENT POLICY

5.1 LEGISLATION

No specific rules for computer imports, the normal import deposit scheme applies, There is no computer utilisation committee.

5.2 NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Funds are now available to undertake research projects from this council which is directly funded by the Kenya Government.

5.3 RESEARCH PROJECTS

a) A project entitled "Computers and Development Policy' has been funded by IDRC from Canada. One of the results of this project will be a directory of computer installation in Kenya. Quantitative data on current staffing, future staff needs, training requirements and computer utilization will be available.

b) A proposed project already mentioned above is to be undertaken by the University and Kenya Posts and Telecommunication Corporation to experiment with dial-up facilities for data transmission. Associated with this project will be the evaluation of second party visual display units which may be maintained and even assembled within the University.

6. COMPUTER ASSOCIATIONS AND USER GROUPS

6.1 ACTIVITIES OF COMPUTER ASSOCIATIONS

The Computer Association of East Africa was formed in 1971 and has met at regular intervals since.

6.2 USER GROUPS

ICL is attempting to set up such a group. Within Nairobi, data processing managers are expected to meet on an informal basis.

7. MAJOR PROBLEMS

The great disparity of remuneration between the public and private sectors is a major problem in staff recruitment, development, and retention. It is so serious that in the development plan for the Institute of Computer Science a professional supplement is proposed for senior technical and academic staff.

APPLICATION OF INFORMATICS IN TANZANIA

MR WILLIAM MAGAMBO

1. Introduction

1.1 The first organisation to use a computer in Tanzania was the Ministry of Finance. It started off with a punch card machine in 1965 and acquired its first real computer on ICL 1901in 1968. Tanesco started in 1963, and was followed by Williamson Diamonds Mines in 1969, Tanganyika Farmers' Association in 1971 and the University of Dar es Salaam in 1972.

Todate, there are 8 computers and 6 minicomputer in Tanzania.

1.2 Inspite of the fact that computers have been in use for more than a decade in Tanzania, there has been no positive steps taken to form computer user groups, and computer associations. Since 1972 great interest has been attracted from various international organisations such as C.I.D.A., U.N.D.P., S.I.D.A., I.L.O., and many other who are willing to help the Government in developing policies and standards in the use of informatics. During 1974/75 investigations were made in response to a recommendation by the Economic Committee of the Cabinet decision based on paper no. 12 of 1974 which charged the Treasury (Ministry of Finance) to appoint a Task force to look into the question of rationalisation of computer use in this country.

1.3 The major problems of computer use in Tanzania are:

(i) Lack of awareness among top decision makers and management of the problems and possibilities of computer use, characterised in early days underestimation of the limitation, of EDP and over optimision in the abilities of computer experts.

(ii) Lack of awareness among user department management, poor communication with computer department and lack of user involvement in the selection and design of computer application.

(iii) Poor planning and lack of feasibility studies.

(iv) Lack of competent computer specialists causing poorly designed computer systems

(v) Lack of displine, lack of standards and poor documentation.

(vi) Lack of foreign exchange.

Apart from the last problem, the rest are not unique to Tanzania and other developing countries. Similar problems have been occuring in developed countries.

1.4 This paper gives a summary of the computer situation in Tanzania covering very broadly the equipment, applications and education and training. There are no users who use communication equipment.

2. Computer equipment and staffing

2.1 The table below gives a summary of the latest computers installed in Tanzania as at 31st December, 1979.

Make & Model	Memory Size	Firm renting the equipment	year Installed
ICL 1901	8K Words	National Provident Fund	*
ICL 1901A	8K Words	Tanganyika Farmers Association	1971
ICL 1902	16K Words	Ministry of Finance	1969
ICL 1902A	16K Words	Ministry of Finance	1971
ICL 1902A	16K Words	University of Dar-es-Salaam	*
ICL 1902A	32K Words	Tanzania Electric Supply Company Limited	1974
IBM 360/20	16K bytes	Williamson Diamonds Mines	1969
IBM System 3	*	Shell and BP Tanzania	1978

* Unknown

Most of these installations are located in Dar-es-Salaam except two - Williamson Diamonds Mines installation is in Mwadui, Shinyanga while Tanganyika Farmers' Association's installation is in Arusha. Apart from the IBM systems and the installation at TRA, the installations are magnetic tape based systems.

Firm commitment to replace some of these computers have already been made by the following organisations:-

(i) Tanesco intends to acquire two ICL 2904/50 computers.

(ii) Ministry of Finance has already signed a contract with ICL for a 1902T 48K words computer.

(iii) Tanzania Harbours Authority, a parastatal organisation formed after the East African Community broke up, is installing a 1901T, 48K Words computer.

(iv) Tanganyika Farmers Association intends to replace their 1901A with a 2903/25 computer.

All the planned installations will be disc based although tapes will not be completely abandoned.

2.2 There are 6 minicomputers, predominantly used by very small organisation, for processing pay roll and inventory control. 5 of the six minicomputers are NCR 399 and the sixth is an NCR 368.

2.3 The major manufacturers in Tanzania are ICL. ICL is a limited Tanzania Company and monopolises the supply of computers. Until 1978 ICL were actively marketing the 1900 series equipment, however, they have now made it clear that they will supply no more 1900 series equipment. For reasons best known to ICL, the supply of any computer equipment to Tanzania (and Uganda) will be on outright sale terms.

2.4 There are approximately 500 data processing staff employed in Tanzania. Only the head of the Computer installation at the National Provident Fund is an expatriate. Although the salaries and terms of service are controlled by the Standing Committee on Parastatal Organisations, these terms of service are not uniform throughout all parastatal organisations. The organisations with better forms of service keep on attracting staff from the other organisations.

3. Applications

The following applications are processed on the computer installations tabulated in section 2.

3.1 National Provident Fund

National provident Funds data validation

3.2 Tanganyika Farmers Association

(a) Customer invoicing
(b) Accounts
(c) Stock checking and Sales analysis
(d) Payroll for TRA, General Tyre and Sanflag (T) Limited

3.3 Ministry of Finance

(a) Government payroll and National Bank of Commerce
(b) National Provident Fund
(c) Water billing
(d) Agricultural Census
(e) Motor vehicle statistics
(f) Post office savings bank application
(g) Registrar of buildings rent applications
(h) Forest inventory

(i) National Insurance Application
(j) Crime statistics (Ministry of Home Affairs)
(k) Import and Foreign exchange (Bank of Tanzania)
(l) Housing loans and Survey Statistics (Ministry of Lands)

3.4 University of Dar-es-Salaam

(a) Students jobs for teaching purposes
(b) Lecturers jobs for teaching purposes and research work
(c) Payroll
(d) Administrative jobs (students admission)
(e) Bureau Services mainly on research and statistical applications

3.5 Tanesco

(a) Customer billing
(b) General Accounting
(c) Stock records
(d) Engineering applications
(e) Payroll
(f) Payroll and other applications for 18 outside clients

Major clients for Tanesco's installation are:

(i) Tanzania Harbours Authority processing in addition to payroll, stock control and accounting systems.

(ii) Tanzania Posts and Telecommunications Corporation processing payroll, telephone and telex billing, accounting and stock control applications.

(iii) Tanzania Railways Corporation who process Payroll for approximately 17,000 employees.

(iv) Ministry of Economic Planning who process Census and migration statistics.

In 1979 46.8% of the total productive machine time, 6240 hours, was utilised on processing Tanesco's clients' jobs.

3.6 Williamson Diamonds Limited

(a) Stock recording
(b) Payroll
(c) Vehicle statistics and Workshop charges
(d) Hospital records
(e) Accounts
(d) Ore reserves

3.7 Shell and BP Tanzania

(a) Payroll
(b) Stock recording

4. Education and Training

Lack of proper training for the Computer Specialist coupled with lack of Computer appreciation courses for Managers are a fundamental cause of most of the electronic data processing problems. In addition to the house training given to all new entrants to the computing profession, the training oprions available in Tanzania are very limited. Manufacturer courses are usually held in Kenya and the few training institutions available in Tanzania are more academic than practical oriented.

4.1 Management and accountancy training programmes organised by the Institute of Finance Management Dar es Salaam and the Institute of Development Management, Mzumbe, Morogoro are taught by citizen staff who have obtained overseas degrees in Computer Science but have not had much business experience in Tanzania. Both institutes do not have their own computers.

4.2 The University of Dar es Salaam recently introduced into their curriculum a Systems Analysis and data processing course for students persuing a 3 - years course leading to the award of a Bachelor of Commerce degree and a post-graduate course leading to the award of a Masters degree in Business Administration. Unlike the IFM and IDM, the University has an old 1902A computer placed under the Department of Mathematics.

4.3 The Eastern and Southern African Management Institute offers a 6 weeks systems analysis and design course and participants in this course have turned out to be quite successful Analysts.

4.4 Due to foreign exchange problems, only few prospective computer professionals have managed to secure scholarships mainly through the British Council for courses leading to the award of HND, Post-graduate Diploma in Systems Analysis and Design and masters degree in Computer Science. Considering the level of education for most of the data processing staff only few are legible for these scholarships. Attention should now be drawn to the possibility of obtaining scholarships for ex form IV and form VI dp staff.

5. Government policy

In 1974 the Ministry of Finance was charged with the responsibility of appointing a Computer task force to look into the question of rationalisation of Computer use in Tanzania.

The task force completed its investigations in 1976. In their recommendations, the task force

(i) outlined procedures for importation of Computer equipment.

(ii) advised the government to cancel orders that had been placed mainly for minicomputers.

(iii) Strongly recommended the development of disc as opposed to magnetic tape systems.

(iv) recommendations the formation of a National Computers Advisory Board.

(v) appealed to all installations to consider seriously the use of modern data preparation equipment namely the Key-edit systems and transaction terminals.

Some of these recommendations were adopted and implemented but the National Computers Advisory Board has not yet been formed.

6. User groups and computer associations. As mentioned earlier, in Tanzania there are no user groups and computer associations. The importance of forming these vital instruments cannot be over stressed. Their purposes will be twofold:- first, for exchange of ideas and information; second to act as a pressure group on the manufacturers. The rationale behind such a pressure group is that a number of users together can exert more leverage than any one alone, in order to get the manufacturer to change his policy and practice e.g. pricing policy, terms of rental agreements etc.

Annex IV/7

Application of Informatics in Sénégal

Sheikh Oumar Signate

Please note:

This report has been compiled from memory, without the use of any reference documents. The object of the information contained herein is to give a broad outline of the present situation in the development of data processing in Senegal.

It cannot therefore take the place of official documentation on this subject. This may be obtained from the relevant authorities in the country.

1. Education and training

1-1 Education available by the state

We shall approach this problem from the three levels of education:

Primary
Secondary
Tertiary

(a) Primary

No instruction of any kind at this level, at present

(b) Secondary

No instruction at this level either. However, the authorities are becoming increasingly aware that steps should be taken in this direction:

to make pupils aware of computerisation

to advise the older pupils on the possibility of careers in data processing.

(c) Tertiary

Computer courses are organised in three departments of the University of Dakar:

at the University technical institute

at the faculty of law and economic science

at the faculty of science

N.B. This is a supplementary course in these three departments. It comes under general studies, and does not lead to a diploma in itself. The only diploma awarded is that for which the students are normally studying, i.e. "Licence" or "Maitrise" (Bsc/Msc)

1-2 Training available by state

This type of training is intended for the users as well as for those who are professionally involved in data processing. Training is done in conjunction with the national computer centre, and also with external assistance in the form of computer instructors, professional agencies specialising in computer training.

1-3 Private training

There is nothing really to report on this point, despite moves by some French companies in this field. But as yet, nothing has transpired.

1-4 Manufacturers/Vendors training

This is the classic type of training given, by the firm which manufactures the computers, to their clients. I should mention here that the entire course is not held locally in Senegal. Certain course require trainees to go to Paris or Abidjan.

1-5 Certification

Although the university provides courses in data processing in certain departments, it does not award a diploma, as I have already mentioned. An experiment has been conducted in the training of programmers and engineers, directly by the national computer centre, for young people who have obtained their diplomas as follows:

Secondary for training as a programmer

Tertiary for training as an engineer.

Discussions are already in progress between the national centre and the Ministry for Higher Education, for approval, at national level, for diplomas to be awarded for this.

The great majority of diplomas in computerisation however, are obrained in other countries:

FRANCE (various schools and institutes)

GABON (data processing institute for Africa, Libreville)
(Institut africain d'informatique, Libreville)

ALGERIA (Algiers)

2. Computer equipment procurement

2-1 Manufacturers ranges marketed and supported

The main manufacturers represented in Dakar and range of products available are as follows:

a. IBM

Most of the models to be found in their catalogue are available:

Series 370 (370 - 145)
3 (3 - 12/ 3 - 15)
3x (32/34)
E (4331)

b. C11-HB

Most of the models of the C11-HB to be found in their catalogue are also available:

Series 64 (64 DPS-2)
62 (62 - 40)
61 (61 DPS)
58 (GE - 58)

C. BURROUGHS

The following two models are available from Burroughs:

B - 800
B - 1885 or B - 1895

It should be noted however, that this manufacturer has installed only computers of the type 800.

d. OLIVERTTI

This manufacturer deals mainly in AUDIT office computer, (AUDIT-6, AUDIT-5).

e. NCR

This manufacturer is the latest arrival on the computer market, and has only the 8150 model available.

N.B. If we consider this list of manufacturers, we can see that two manufacturers, namely IBM and C11-HB have more or less captured the large scale computer market. The other manufacturers are mainly concerned with mini computers. Here too, we find IBM and C11-HB.

2-2 Mini computers

We should mention that manufacturers who specialise in MINI and LEADERS in this field, are not yet represented in Senegal. (DEC, WANG, HEWLETT PACKARD). This is a very regrettable state of affairs for the computer situation in Senegal, as these manufacturers offer equipment which is technologically advanced in specific areas, compared with other types of equipment:

DEC (scientific calculations and automatic control instruments)

WANG (automated management and word processing)

HEWLETT PACKARD (data bases, scientific calculations)

2-3 Numbers installed

Data processing is used in the various national sectors:

public

semi-public

private

The following list is not comprehensive, and contains only the principal users in the field of data processing:

a. Public

Ministry of Finance	IBM-370-145	(2)
Ministry of the Interior	HB-MITRA-125	(1)
General Treasury	HB-61-DPS	(9)
Faculty of Science	IBM-1130	(1)
University institute of technology	IBM-1130	(1)

b. Semi-public

National Development Bank	IBM-4331	(1) on order
Department of pensions	HB-64-DPS-2	(1)
Electricity Board	HB-2040	(1)
Railways	IBM-3-12	(1)
Building societies	IBM-3-12	(1)
Port of Dakar	undecided	
Centre for oceanic research	undecided	
Post Office savings bank	OLIVETT-AUDIT-6	(1)
Giro system	undecided	

c. Private (banks)

Large scale mills	IBM-34	(1)
Cemetery	HB-GE-58	(1)
Sugar company	IBM-34	(1)
Agence africaine de représentation	IBM-34	(1)

N.B. The noticeable feature about this list of users, is that computerisation is to be found in virtually all sectors of national activity, but most particularly in the banking sector. In fact, the whole of the banking system either has been computerised, or is in the process of computerisation.

The particular products used in these companies are as follows:

HB	16
IBM	12
OLIVETTI	1
TOTAL	29

The number of installations seems to favour HB, but this does not take into account their value. In fact, the installations at the Ministry of Finance, which are IBM, are by far the greatest in value in the whole country.

2-4 Local assembly on manufacture

There is no company which assembles or manufactures computers.

It would be difficult to envisage any activity in this direction for the moment. Indeed, the Senegalese market would be unable to justify such investment. It would be preferable to encourage regional or sub-regional development in this field.

3. Communication facilities

The big problem which arises here is the lack of feasibility of telecommunication channels, which do not have the capacity to transmit data. A few experiments in tele-processing have been carried out since 1977, as follows:

Processing of customs declarations

port invoicing.

These projects have been temporarily suspended until the problem of telecommunication channels has been solved.

N.B. A special project by the post and telecommunication office is being studied, with the purpose of establishing a data transpor network, as distinct from the normal telephone network.

4. Computer applications specifically for development

4-1 Census processing

A general population census was carried out in Senegal in 1977, in collaboration with the United Nations. The results of this census, however, have still not been finalised. Appreciable interim results have been obtained despite this.

Two types of problems arose during the course of this exercise:

Inadequacy of software used: TPL

Lack of competent processors in the project team.

These two problems are in the process of being resolved:

Installation of an improved version of software for statistical processing.

Assistance of a computer expert from the United Nations, specialising in processing of statistics.

4-2 Bibliography data files

The national centre for scientific and technical documentation has created three national data bases, whose objective is document administration, which may be defined as follows:

The first is a collective catalogue of periodicals.

The second is the current index of economic, scientific and technical documents.

The third is an inventory of organisations connected with documentation in Senegal:

documentation centre

archives

libraries

These data bases operate under a system for the administration of documentary data, known as "ISIS", developed by the team of UNESCO, and used in conjunction with computer 370-145 of the Ministry of Finance.

4-3 Others

There are three other data processing projects which may be included in this section, and which are worthy of mention here:

a) Inventory of scientific and technical potential

b) Data bases for development

c) The programme for national development

N.B. Project (a) is carried out in conjunction with the institutes of the SAHEL, in BAMAKO. Project (b) is carried out in conjunction with the CEROC computer centre of the University of Liège in Belgium. Project (c), the most important one, is carried out in conjunction with the UNDP (United Nations Development Programme) and USAID. This project will continue for five years, and will make use of advanced techniques such as data bases and teledetection.

5. Government policy

5-1 Organisation of data processing at national level

comprises two bodies:

The Comité National Informatique (National Committee on Computerisation) founded in 1972. This committee is the decision-making body for policies on computerisation. It is presided over by the Prime Minister, and groups together representatives of the principle computer users in the public and semi-public sectors. It meets twice a year.

The Direction du Traitement Automatique de l'Information (Department for the automatic processing of information) which comes under the Ministry of Finance (founded in 1974). This department, which directs and controls state resources of data processing, acts as the national computer centre. In this capacity, it controls the application of decisions taken by the national committee on data processing, and ensures a technical supporting role towards the centres in the public and para-public sectors.

5-2 Development of data processing policy

The data processing policy in Senegal has developed in three stages:

a) A phase of non-controlled decentralisation (1964-1972) decentralisation: Several centres were formed during this period.

Non-controlled: the need to define a data processing policy was not recognised at this stage.

b) A phase of centralisation (1972-1978)

The state was confronted with the following problems:

installation costs and under utilisation,
lack of qualified personnel.

It therefore felt the need for an organisation to coordinate data processing activities. This was the Comité National Informatique. One of their first jobs was to regroup a number of centres:

the National Bank and public service centres
electricity and water board centres.

c) A phase of controlled decentralisation as from 1978

In this year, the national committee on data processing took note of the changes occurring in the computer field in Senegal:

Processing equipment much cheaper than in the past,

Regular appearance in the work force of persons

well qualified in computerisation.

The committee therefore decided to return to the policy of decentralisation, in order to make full use of these qualified people.

This new decentralisation, however, is guided by the SCHEMA DIRECTEUR DE L'INFORMATIQUE (Guidlines in data processing). This is still being compiled in collaboration with the FONDS EUROPEEN DE DEVELOPEMENT (European Development Fund).

N.B. The Schéma Directeur de l'Informatique will establish the priorities in automation in the various fields of national activity. It will also include several technical annexes which will act as a standardisation for decentralisation. These standards will apply in the following cases:

Application development

Establishment of a data processing unit

Scope of a data processing unit

Choice of computer equipment (materials, software)

5-3 Research projects

In the field of research, it should be noted that studies are in progress to provide the national centre for oceanic research with a computer centre.

N.B. This computer centre, although it is installed in the centre for oceanic research, can be used for all the research centres in:

agriculture

forestry

animal husbandry

agronomy

6. Computer associations and user groups

There is very little to report in this section. The national committee on data processing is very much aware of this.

It is at present engaged in the formation of internal computer committees in all organisations using data processing.

The role of these committees will be twofold:

to coordinate computer activities in the organisation, and to decide on the priorities.

to act as external liaison with:

national data processing committee

other data processing committees

subsequently, user clubs

Conclusion

I have given you a brief outline of the present situation as regards computerisation in Senegal.

You will see that this description applies only to internal action of the authorities and to those responsible for data processing.

Outside its boundaries, Senegal has always shown great interest in the various experiences of other countries, and in meetings which can contribute towards the advancement of its national programme on computerisation. It is also ready to give the benefit of its own experience to those who wish to avail themselves of it, as is the case with the states of the Sahel, which are grouped under the Institute of the Sahel.

I hope that this present meeting will allow these two principles to be put into practice at regional level, exchanging reports and ideas for the benefit of all the different countries in the region.

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

Regional Meeting of Computer Centre Directors in Africa

Arusha, Tanzania 14-18 April 1980

WORKING DOCUMENT

Contents

(a) Development of regional network of computer centres and exchange of personnel

(b) Education and training in informatics.

(c) Computer equipment procurement in the region.

(d) Hardware and software developments and establishment of research projects.;

(d) List of cpmputer applications with particular relevance to the African region.

(a) DEVELOPMENT OF A REGIONAL NETWORK OF COMPUTER CENTRESIN AFRICA

Introduction

Computers have been used in Africa as far back as 1960 and since then Computers have become very popular, more so than any other innovation in management science. The size of the installations in Africa is not significantly different from what exists in the developed world. Despite the two decades we have been using computers there are reports of organizations in East Africa being disatisfied with the benefit - delivery from their Computers. There have been forums in papers, Conferences and articles on the misuse of Computers in developing countries. A lot of countries in Africa have in fact condemned Computers and very often concluded that the machines are not profitable to maintain as such they should be scrapped. The outcry of many countries in Africa on the effect of misuse of Computers has been widely heard and this is not without reason. First and foremost of all, these machines are manufactured outside which results in a big waste of their scarce foreign exchange which goes out in the form of rental charges and salaries for Computer professionals who are in many cases from overseas. We could go on to discuss this problem of misuse of Computer for a long time but the concensus would support the view that Computers to-date in Africa have largely been misused and underutilized.

Several reasons for this poor success have been given, among them and foremost is the lack of national policies to guide the use of informatics in the countries in this region. This being the case there has been any formal ways of the organizations knowing what the other Institutions are doing. It is therefore no accident that there are no links between the various Computer Cenres in many African Countries. For example for some of the Computer Managers here it is the first time they are meeting each other. Cooperation in the informatics areas is likely to benefit the field a lot just as cooperation has proved very successful in other fields. This is why we are advocating the development of a Regional network of Computer Centres in Africa.

The Network Concept

The importance of Regional networks on informatics has been emphasized in a lot of papers and conferences. For example a Computer Manager's Seminar held here in September 1979, it was recommended that there should be a regional network for all Computer centres in East African and the participants hoped that once this East African Regional network has been developed we could then go ahead to join with other networks in Africa in that way ensuring full development of informatics.

Before such a network can be developed there are a few things that each participating country should do. To begin with each installation should be well established and be properly staffed. Once each installation is properly functioning there should be an instrument at a national level that will be responsible for ensuring proper utilization of computers in the country. This instrument could be in the form of the National Computer Centres that some countries such as Sudan and U.K. have. The aim of the National Computer Centre among others should include:-

(i) To ensure that the use of computers reflects national goals and priorities.

(ii) To control the acquisition of Computers by ensuring that computers are introduced only into organizations where both management and Computer Specialist personnel exist to make effective use of them.

(iii) To promote and encourage effective Computer use in the country.

This would ensure that each country has some form of a national policy for computer use. It has been seen that those countries that have had such national policies have been very successful. Each Computer Centre should then clearly understand the role that it is to play for the network to work properly. This would also ensure that once the network is in operation the National Computer Centres can then actively participate in the action programme of a regional network.

The network will comprise only institutions designated by the member states and in most cases these would be the National Computer Centres.

Functions of the Network

We have seen the importance of the network and the advantages that we can get out of it. The following suggestions are made for the functions of the network.

1. To promote an awareness of the need for continuous review and development of various aspects of informatics.

2. To monitor the developments in the participating institutions with regard to development in various aspects of informatics.

3. To assist and provide services for the establishment of new facilities in education training and research in informatics.

4. To help in identification of priority areas for collaborative research and provide assistance in the execution of projects in the participating institution.

5. To encourage and promote the exchange of personnel at different levels, develop exchange programmes, establish mechanisms for the award of fellowships for the training and research programmes.

6. To organize short-term seminars on subjects of common interest relevance to the participating countries and to promote the establishment of long term training programmes.

7. To assist participating institutions in obtaining proper service and maintenance of hardware.

8. To promote the development and exchange of adequate software.

9. To promote the exchange and dissemenation of information, publications, periodicals, textbooks, research papers etc.

10. To promote the exchange of information and experiences on policy, applications, technology and hardware procurement and to give necessary assistance on such matters.

Organizational Structure

For the network to operate properly we need a sound organizational structure. I would therefore recommend that a full permanent Secretariat be established with adequate staffing. This should be located in one of the participating countries preferably in a central location. Furthermore there should be a policy making body composed of one representative from each of the participating countries. The policy making body which could be called "A network Council" should meet at least a year with a chairman elected at every meeting.

Finance

It is envisaged that in the initial stages a major part of the finances will be provided by various agencies of the UN System including UNDP, UNESCO etc. It is hoped that at a later stage the participating Institutions should encourage their governments to allocate money for the network project and the contribution should be based on the OAU member contribution schedule.

Conclusion

As I mentioned earlier this paper was presented for discussion and it is hoped that after the discussion we can come with a more refined document on a Regional network.

(b) EDUCATION & TRAINING IN INFORMATICS

Introduction

This first section will outline some of the background issues related to education and training in informatics in the African region. The second section will categorise the main courses now required for new entrants to the profession. The third section deals with advanced workshops and education of management and users. Finally a bibliography is included.

1. Background issues related education and Training in informatics in the African region

1.1. Subject Nomenclature

The use of the terms computer science, informatics, information processing are discussed in some detail (2.) At the University of Lagos there is a Department of Computer Sciences. Whilst at the University of Nairobi an Institute of Computer Science exists to teach and research into computer science/information processing subject, whilst a diploma in computer systems is expected to start later this year year.

1.2. Estimates of training needs

Much has been written on the needs for national training plans for informatics (1). (2), (3) but little can be done without quantitative data on existing computer installations. It should be possible to maintain and update directory of computer installations. It should be possible to maintain and update directory of computer installation and related staff requirements for the whole country. From this data educational and training projections can be done.

1.3. Practical Oriented Training Requirement

At present the type of education and training required as priority is for practically rather than academically oriented. The installation of many smaller mainframes in the 1980's leads to a different requirement for training which involve an installation staff running a custom programmed computer solution supplied by the Vendor.

1.4. Centres for Education and Training

If education and training are to be successfully provided proper equipment (hardware and software) must be available as well as a proper training environment. With so many packages courses available each institution must be equipped with overhead projectors, slide projectors, slide making equipment, video player, etc.

1.5. Retention of training staff

Considerable difficulty is experienced with the retention of data processing staff by the public sector. In particular a University or similar training institution faces a severe problem retaining the local staff after a considerable investment in time and money in training of the trainers. The only pragmatic solution is to provide for public employees in this field to be paid a professional supplement to equate their remuneration with that obtained in the private sector. Whilst local staff development can be undertaken international aid agencies will be still required to assist the funding of skilled expatriates staff.

1.6. Aptitude Testing

Most computer vendors and private computer training firms still provide for a fee the ritual of the aptitude test as the key to entry to the computer careers. Little work on its current relevance in the region has been undertaken.

1.7. Private Computer Training Schools

One of the observations made in Arusha (17) was concern at the exploitation of the general public by some private computer training companies. Control of their activities by national governments was implored to prevent uniformed members of the public from being given unsuitable training which may not be acceptable by potential employers.

1.8. Examination and Assessment

Examinations and assessment of existing data processing specialists becomes a major problem when new formal courses are introduced for new entrants from formal schooling. For the orderly growth of the profession some ways of assessment of experience should be devised. It may be appropriate for the computer society or association to evolve to become a professional society with a full-time secretariat to undertake this role. Experience to date throughout the world has not been without considerable difficulties.

1.9. Pan African association of University Departments/Institutes or Institutions.

A most fruitful exchange of ideas and development can be maintained with the establishment of a panafrican association of University Departments/Institutes or Institutions involved with information processing training. It is the kind of association that UNESCO should be able to support and enable an annual meeting to take place. Regional conferences/seminars could be arranged from this forum and exchanges of experiences and material initiated.

1.10. Coordination of training and education on a regional basis

The international aid agencies should be requested to provide scholarships to local personnel from the region to attend existing/proposed courses at Institutions in the region. This would be until such time these facilities exist within the nation if these can be justified, if ever. The duplication of resources should be discouraged at all costs.

1.11. Response to proposed Council for the Application of Computer Technology for Development in U.K.

The President of the British Computer Society Mr. Julian Bogod in his presidential address in 1979 proposed the formation of a Council for the Application of Computer Technology for Development (15) Among the proposed tasks of the council are:

a) establishment of curricula, courses of instruction and examination structures.

b) provision of educational facilities in U.K. for students.

c) planning and training of technical facilities.

d) preparation of training materials, technical manuals and teaching aids.

If this Council is established it would be appropriate for the region to be able to take up these offeres of assistance prepared in advance.

2. Education and Training for new entrants to the profession

2.1. Postgraduate

The main development that have taken place are at the postgraduate level. The postgraduate diploma in computer sciences at the University of Lagos is sponsored by the University of Lagos, UNESCO, and OAU/STRC. (9) The course comprises the following subjects: Programming Languages, Computer Software Systems, Data Structures and Hardware Systems, Graph Theory, Systems Analysis and Simulations, Operations Research, Numerical Analysis, Probability and Statistics, Coding and Information Theory, Information Systems Design, and one programming project. The University of Nairobi proposes to mount a postgraduate diploma in Computer Systems in 1980 at the Institute of Computer Science, initially to Kenyan students, The course comprises the following subjects: Foundations of Computer Systems, Information Processing, Programming Methodology, Software Systems; Principles of Accounting and Management, Business Systems Analysis and Design, Assembler Language Programming, Computer Technology, Operating Systems, Scientific and Engineering Computing, Computer Management, Database Management, Advanced Programming, Simulation, Computational Statistics, Mathematical Programming, Computer Assisted Engineering Design; and a computer systems project. Both of the above courses have compulsory and optional subjects. The Lagos course seems more scientifically oriented whilst the Nairobi course is more business/ data processing oriented.

An observation made in Arusha in 1979 (17) was that a course should be available to non-graduates who have a minimum number of years of experience at a senior level in a computer installation, and for new graduates a minimum of one year of experience would be a pre-requisite. The course should be available on a part-time basis.

2.2. Undergraduate

At a considerable number of Universities undergraduates from the Faculties of Engineering, Science and Commerce receive service courses in the foundations of computing and at least one programming language. At the University of Nairobi a modular structure to these courses is being evolved. A considerable number of course syllabuses for Computer Science curricula have been published, Curriculum 68(4) and Report on degrees in Data Processing (5). Work should be undertaken to evolve more courses in information processing subjects at the undergraduate level eventually leading to joint degrees. By now all undergraduates should receive at least one course in information processing. The most suitable placement of the unit in a University may be independent from existing faculties to demonstrate the multi-disciplinary nature of the subject (18).

2.3. Post A-Level (Higher) School Course

A considerable number of students from the region have attended courses equivalent to the Scottish Higher National Diploma in Computer Data Processing at Aberdeen College of Commerce (8). The need for this level of course was mentioned in the observations in Arusha in 1979 (17). The most suitable venue for this course may be at a national University.

2.4. Post O-Level (Form 4) School Course

At least one such course was mounted in Zambia at the Zambia Institute of Technology in Kitwe as a 2-year Programming Certificate course. A good syllabus already in use is the Scottish National Certificate in Computer Operations (7). The need for this level of course was mentioned in the observations in Arusha in 1979 (17).

2.5. School Courses

Attention should be drawn to the work already undertaken by the British Computer Society Schools Committee Working Party. A document entitled Syllabuses for the Future (6) has been drawn up to keep so called 'Computer Studies' courses up to date. The subjects included are: The Automatic Control of Processes, The Concept of Input Process - Ouput Coding Systems; Preparation of Input - Interpretation of Output: Using Computer Program Packages; Information Storage and Retrieval; Hardware in Context; Special - purpose and General - purpose computers; The effect of the Cashless Society; Computers and People, Communications Systems; Computer Manipulation of Text, Number, Picture and Spoken Word; Artificial Intelligence; Computers and Employment; Computers in the Economy. The author did publish a text produced in Nairobi in 1971 with the schools population as a target (16).

2.6. Systems Analysis & Design Training

The East African Management Institute in Arusha has been running on Information Systems Course for several years. A well documented and updated course has been available for many years from the National Computing Centre in U.K. In 1979 the cost for the course material was £3500 for a Lecturers version and £350 for the student kit. (11) There is demand for such a course to be given in Kenya at least once a year.

2.7. Data Entry and Data Control Personnel Training

Two areas where key personnel are involved is in data entry and data control. In most instances these personnel have only attended a skills course on data preparation. It is time that all new entrants to these positions are given formal training on the principles of information processing.

2.8. Vendors Courses

The current practise is for the majority of new entrants to the profession only to be able to attend the courses run by the computer vendors usually at a regional centre rather than on a national basis. These courses are usually well designed but have the obvious disadvantage of their product orientation.

3. Advanced Workshops for existing personnel and education of management and users.

3.1. Advanced Workshops

In the Development Plan for the Institute of Computer Science at the University of Nairobi a framework for advanced data processing on a national basis is proposed. A consultative committee will devise an annual programme of short fulltime courses and "workshops" of an advanced nature for computer professionals and information processing specialists in the country. Such a consultative committee is expected to be drawn from the University, government private industry, vendors, international aid agencies, and the Computer Association of East Africa. It will be obligatory that each academic member of staff of the Institute would give at least one such course in his/her specialization in each annual programme of courses. At least three professionals from outside Kenya would be invited each year. Courses that are expected to be mounted in 1980/81 include; Structured Programming, Microprocessor, Operating Systems, Financial Modelling, Distributed Processing, Statistical Computations.

3.2. Video Recorded Teaching Packages

There are now available some courses that are documented and video recorded to enable individual students to follow the material at his/her own pace. The National Computing Centre in U.K. has such courses available in the programming languages FORTRAN, ALGOL, COBOL. Each package costs in the region of £2250 but require the video play back equipment.

3.3. First Level Computer Programming

A modularly designed course that offers formal training for those wishing to become computer programmers in a commercial environment. This course includes Fundamentals of EDP (26 hours), Programming concepts and Techniques (40 hours), High Level Language Programming (COBOL) (52 hours), and a Programming Project (55 hours). All the modules can be run together as a 6 week course or in modules. This course is produced by the National Computing Centre and costs in the region of £1800. This course may be suitable for first level entrants direct from school or for suitably experienced computer operations staff that show aptitude.

3.4. Part-time Extra Mural Courses

Where a public training establishment exists a series of part-time (evening) course on an extra mural courses are usually well attended and do provide an important input into the user education of computers.

3.5. Management Appreciation Courses

One of the most important course that is required is at the level of management appreciation. It is important that such courses are available on a regular basis in addition to those already run by the vendors with particular emphasis to their own products.

3.6. Government Institutes of Administration

It is most likely that national governments do have their training centre for public administrators or Institutes of Administration. It is most important that the course outlined in 5) above is run at all levels of training in order to obtain maximum use of government computer centres.

4. Bibliography & Reference Documents

1. The Application of Computer Technology for Development - UN 1972

2. Guidelines for a National Policy for Education in Informatics - IBI Green Series No SPIN 101 - April 1976.

3. Considerations on Education Policies in Informatics - IBI Green Series No SPIN 201 - July 1978.

4. Curriculum 68 - Recommendations for Academic Programs in Computer Science - Communications of the ACM March 1968.

5. Report on degrees in data processing - The Computer Journal Volume 18 Number 4.

6. Syllabuses for the Future - British Computer Society Schools Subcommittee Report 1980.

7. Scottish National Certificate in Computer Operations Syllabuses - Aberdeen College of Commerce 1979.

8. Scottish Higher National Diploma in Computer Data Processing Syllabuses - Aberdeen College of Commerce 1979.

9. International Postgraduate Diploma in Computer Sciences - University of Lagos - 1980.

10. Postgraduate in Computer Systems Syllabuses - University of Nairobi - Institute of Computer Science (proposal) 1979.

11. Training Library for Systems Analysis Course - National Computing Centre, U.K. 1979.

12. Programming in FORTRAN, ALGOL, COBOL - video recorded teaching packages - National Computing Centre, U.K. 1979.

13. First level programming course - National Computing Centre, U.K. 1979.

14. The Implications of Computer Systems - a Manager's Course - National Computing Centre, U.K. 1979.

15. The Role of Computing in Developing Countries - Julian Bogod - British Computer Society Presidential lecture No 2-1979.

16. Computers for Developing Countries - Robert Scott, East African Publishing House, Nairobi - 1971.

17. General Observations on Computer Managers Seminar at E.A.M.I. Arusha, 1979.

18. The Role of a Computer Centre in a University in a Developing Country - Robert Scott, Overseas Universities August 1979.

(c) Computer Equipment Procurement in the Region

Probably the toughest task of any organization in using computers is being able to determine the best machine to use. There are now several manufacturers of data processing equipment that procedure hardware suitable for most organizations with each manufacturer offering a variety of units. As business becomes more complicated the number of interacting variables and suppliers may increase significantly.

Recent studies have showed that those organizations that have followed the proper procedures for computer equipment procurement have been very successful while those that have not had proper procedures for computer equipment procurement have experienced nothing but disappointments. Of late there have been a lot of lawsuits being brought by users against practically all types of suppliers of computers and computer services, Equipment problems and failure of manufacturers to deliver what has been promised have been the major problems currently facing a number of users. Essentially all that is required is a policy determination by top management to procure computer equipment and services in the same business like the way used to buy less complicated and less critical goods and services. I will now attempt to give suggestions on how best organizations should go about in procuring computer equipment.

Guidelines for Computer Procurement

Before any organization decides to acquire a computer it should ensure that a number of important things are done.

a) Ensure that these are top management participation and support even before you start making preparations for procurement.
b) There should be adequate planning and control.
c) There should also be adequate consideration of human problems that will be caused by the introduction of the Computer into the organization.

Unless this preparatory work is done the chances are that the machines are not going to be suitable.

The process of computer procurement has four phases:

These are:

(i) Feasibility study

(ii) Preparation of specifications

(iii) Obtaining of Equipment Proposals

(iv) Selection.

(i) Feasibility Study

Three important questions during the feasibility study.

(a) Is EDP Equipment necessary?

(b) Any immediate payoff?

(c) Is it only for prestige

(ii) Preparation of Specifications

Statement of requirements presented by the organization. This statement is used for two, main purposes. Those specifications are used as a summary of the proposed system for internal use. Secondly the specifications are used for invitining equipment proposal.

Table I

1. INTRODUCTION
(a) Description of org, and what it does
(b) Summary of requirements
(c) Current equipment
(d) The selection process - criteria to be used etc.
2. System requirements
(a) Hardware features required
(b) Software required
(i) Computer (fortran, cobol, Feg etc.)
(ii) Utility packages
(iii) Application packages

Table I (cont.)

(iv) Operating system
(c) Support required
(i) System designers
(ii) Back up facilities
(iii) Test tune and facilities
(d) Constraints
(i) Planned delivery date
ii) Time constraints on processing
(e) Capability for future growth
3. Major application
(a) System description
(b) File description
(c) Input data specifications
(d) System flowcharts

(iii) Obtaining Equipment Proposal

After the specifications have been prepared the organization goes ahead to invite equipment proposals based on a preliminary screening four or five vendors may be invited to submit proposals. The manufacturers should present their proposal in an agreeable format as suggested below.

Table II

1. Proposed equipment configuration
(a) Equipment units
(b) Equipment operating characteristics
(c) Alternative configuration
(d) Expansion capability (Modularity)
(e) Any special requirements
2. Cost of proposed configuration
(a) Rental and purchase price by unit
(b) Extra shift rental
(c) Maintenance contract
(d) Software rental

TABLE II (cont.)

3. Software availability
4. Systems support
(a) Systems Analysis & Programming
(b) Customer Maintenance Engineer available
(c) Education support
(d) Availability
5. Terms
(a) Acceptance of specified delivery date
(b) Payment terms
(c) Lease-Purchase and other options
(d) Amount of test time to be allowed
6. System performance for specified applications
(a) Changes in design
(b) Timings
(c) Changes in Timings Wing Optional Equipment
7. Other Information

Ranking of Equipment Proposal

This is usually very simple if there is only one manufacturer. Usually we have more than one manufacturer. The usual procedure therefore is to select some criteria for evaluation of the various manufacturers. The important thing is that each organization should be able to come up with a list of criteria for evaluation which will be acceptable to both the manufacturer and the organization. Table III below gives an example of a summary for point ranking.

Table III

CRITERIA FOR EVALUATION	POSSIBLE POINTS	PROPOSALS		
		A	B	C
1. Systems Performance 42%				
a) Hardware Performance	60	60	41	42
b) Software Performance	60	39	43	31
c) Expansion capability	55	41	48	30
2. Vendor capabilities 25%				
a) Vendor performance	40	25	32	21
b) Maintenance & Packup	20	14	18	13
c) Installation support	20	12	18	12
d) Staff Preference	25	15	20	14
3. Cost 33%				
a) Rental Price	50	35	23	40
b) Terms for extended use	20	17	5	18
c) Ongoing Educational Cost	25	21	9	14
d) Maintenance & Backup Cost	20	15	10	12
e) One time system & education cost	20	18	11	14

Preparing the Contract

Once the organization has made up its mind on the type of computer it should then go a head to sign a contract with the manufacturer that really describes the transaction negotiated. It is usually recommended that organizations should set up a team to deal with the procurement issue. This team should usually be made up of the following; a financial man purchasing officer, computer specialist and a contracting or legal officer.

In the actual contract the following should be considered

1. Delivery date and the damages
2. Payments and warranties
3. Limiting liability
4. Putting agreements in print
5. Evaluating the progress

It will be very rewarding for organizations if this approach is followed.

(d) Hardware and Software Developments and Establishment of Research Projects

1. Hardware Developments

1.4 Towards Centralization and Large Computers

Arguments can be put forward for greater centralization to overcome this underutilization. In the UN Report (1) the following arguments were put forward to support a centralised government services bureau.

a. Costs are lower for a single large computer than for several small machines (the doubling the cost of an installation yields approximately four times the productive capacity);

b. Operating overhead costs, planning, space and salaries for example, are proportionately less for centralized facilities;

c. It is easier to maintain level, balanced world loads in a large multi-purpose installation;

d. Better use can be made of a single pool of trained manpower;

e. It is clear to build towards integrated information systems.

The DIGITAL Distributed Systems Handbook (2) suggests the following advantages of big computers (costing more than US $200,000)

a. Instruction Execution - the bigger the computer, the less it costs to executive a single instruction (i.e. the processor cost divided by instruction rate is less). Hence large processor bound applications, such as very complex scientific calculations, use the largest system available. Most data processing operations are not processing limited, but rather data access limited and communications limited.

b. On-line data storage - the lowest cost for on-line storage can be achieved by lumping many applications together on a single large system.

c. Systems Operations - most computer-based information systems require some support staff. This support is least expensive with a centralised facility.

d. Systems design - similarly most systems require some number of analysis, design, and implementation specialists. These experts can be provided most economically from a central facility.

SO WE CENTRALIZE ON FEW LARGE COMPUTERS?

1.2. Towards Decentralization and Small Computers

Arguments can be put forward for greater decentralization. In the UN Report (2) the following arguments were put forward to support decentralization.

a. Greater Independence of tasks and better opportunities to apply priorities and build up specialized operation.

b. Less delay and lower costs for data transmission.

c. Greater protection against breakdown of machines.

d. Work done closer to where results are needed.

The DIGITAL Distributed Systems Handbook (6) suggest the following advantages of small computers (costing less than US$200,000).

a. Capital Costs - if a system plan is based on multiple smaller computers, money can be invested in computer power as it is needed, in smaller increments.

b. Cost Allocation - if each major applications uses an independent computer system, the cost of automating each application can be easily identified.

c. Technology advance - if the smaller computer is part of a family of compatible products, then as computer power is added, the incremental systems can be the most modern model, benefiting from the recent advances in technology.

d. Communication Costs - the data and processor can be located optimally with respect to their use.

e. Data Security - data security problems are minimized if the data and processor are placed with the users.

f. Usability - locating the computer system near the user minimizes the person-to-person communication problems of using the system.

SO WE DECENTRALIZE ON MANY SMALL COMPUTERS?

1.3 New Developments

With the recent cost reduction in hardware and storage and the likely continuation of this trend other forms of processing are now available to the smaller user which were previously only available to the users of large installations.

These are:

a. Transaction Processing Systems;
b. Timesharing Systems;
c. Enquiry Systems;
d. Word Processing Systems

and they all depend for their full exploitation on the telecommunications facility for the data transmission being available from the National Post Office monopoly.

a. Transaction Processing Systems

An interactive computer system that is used for data processing applications by people with no computer-specific training is called a "transaction processing"system, simply because the data is processed in single, interactive transactions, rather than in traditional batches.

b. Timesharing System

In timesharing many users are connected on-line to a single machine, which is programmed to make it appear as if each user had private use of a smaller machine. The on-line user develops, tests, and executive programs,much as if using the control terminal of a small computer.

c. Enquiry Systems

Enquiry systems are interactive programming systems designed for extracting data as easily as possible. Rather than having to know the details of programming languages, or the precise formats of the data file, the enquiry system user can pose questions of the form "Find me all the employee records for employees earning less than 1,000 per month."

d. Word Processing Systems

An interactive computer system that is used by the normal secretarial staff in an office to produce accurate documents stored in draft form on backing storage. Much of the repetitive drudgery of the "clerical mess" is removed from the office.

1.4 Purchase of Hardware

Where Computers are purchased and utilised for a period in excess of approximately 3½ years the user can show a savings of expenditure. Experience of refurbishment of old equipment does not appear to provide the financial advantage that it suggested before the event, as described in a case study by SCOTT (3). In the early 1970's the idea of large scale provision of old computers was suggested but is not heard of today.

Then there are questions on the strategies of marketing of computers in the countries of the region that must be answered.

a. Sole Supplier - should a country be dependent on one manufacturer for supply of its d.p. equipment,

b. Multiple Suppliers - should a country restrict the participation of the number of manufacturer for supply of its d.p. equipment in the way in which motor vehicle suppliers are restricted?

c. Models Marketed - should the suppliers market only a restrictive range of their products and at whose decision.

d. Back-up installations - should any Computer installation be installed without provision of an adequate back-up in the installation locality?

e. Local Manufacture - should be local assembly of computer installations be the trend to be encouraged, (already started in Kenya).

f. Microprocessor Development - should National Governments make definitive plans on the exploitation or otherwise of micro-processors.

At the meeting in Arusha in 1979 (4) these developments were discussed and the following observations made. The use of terminals and remote data collection techniques was viewed as economic solutions to data processing utilization and efficiency today. Considerable concern was expressed at the installation of stand-alone computers with no back up locally. The order or acquisition of new d.p. equipment before d.p. staff have been appointed was not recommended.

2. Software Developments

2.1. Programming Languages

From surveys carried in Zambia and Kenya the author has found that by far the most popular programming language in use is COBOL. It is only in the past 5 years that RPG has found popularity with the introduction of the smaller machines namely the IBM System 3 and ICL 2903. It now appears likely that with the introduction of the WANG computers and ICL 1500 that the BASIC programming language will gain appeal. The University of Nairobi is shortly to use PASCAL.

What is striking from the above distribution of language usage is the relatively low usage that standard packages have been used. An example of rewriting standard statistical software described by SCOTT (7).

It is surely absurd to have approximately 80% of installations writing their own systems in COBOL, RPG or PL/1?

2.2. Applications Processed

From surveys carried in Zambia and Kenya the author has found that the following application are processed in over half of the installations interviewed:

General/Debtor/Creditor Ledgers
Stock Control
Salaries
Invoices
Personnel Records
Statistical Tables
Sales Statistics
Hire Purchase/Loan Accounts
Assets Register
Pension Payments
Order Processing

If a standard applications system is written in each of the major programming languages in use of the majority of systems and programming talent in the country will be available to utilize the underutilized equipment.

The tendency for the vendor to supply the customer with tailor made software is becoming increasingly common with the smaller, cheaper computers now being installed.

3. Other Developments

a. Systems Software - operating systems, language compilers and interpreters, loaders, executive programs, and teleprocessing software are almost entirely developed by the manufacturer and supplied as part of the installation.

b. Software Charges - over the past few years all new computers now supplied in the region are provided with software in "unbundled" form. The user pays a charge for the use of the software supplied with the computer installation.

c. Software Bureaux and Consultants - there is a considerable increase in the numbers of consultants working as individual or as at bureaux providing custom built software.

d. Structured Programming Techniques - there is a considerable improvement in systems and programming productivity achieved with the use of structured programming techniques which have only a few practitioners in the region.

e. Standard Applications Packages - increasing use is being made of standard application package provided on a world wide basis e.g. SPSS, GLIM, ECAP etc. No longer is the hardware vendor the sole supplier of software.

It is important for the region to be able to utilize software developed locally and to be able to utilize expertise in the use of particular applications packages.

3. Establishment of Research Projects

3.1. An important project to be undertaken on an on-going basis is related to Computers and Development Policy in each country. Such a project should maintain an inventory of all computer installations updated on an annual basis.

3.2. Most telecommunication facilities are in the monopoly hands of a parastatal post and telecommunications corporation who at the moment only provide data transmission using their dedicated lines with their modems. It should be possible to develop the use of the dial-up facility for data transmission on an institution's telephone network. Such a project could be undertaken jointly by the parastatal and the [illegible] institution on an experimental basis.

3.3. The exploitation of the microprocessor in product development is only beginning to be taken seriously. In the University of Nairobi, the Department of Electrical Engineering, Department of Physics, and Institute of Computer Science are all planning to undertake work on different application of microprocessors.

3.4. The use of word processors to avoid and eliminate the "clerical mess" needs to be studied with particular regard to the socio economic effect on employment opportunities.

3.5. As already mentioned at an earlier session considerable difficulties exist in the maintenance of manual library records in nearly all the national Universities. Considerable progress in the library automation has been undertaken in Europe and America. It should be possible to undertake a general project to find a feasible solution to this common problem. Once the national University library is automated, all accessions within a country are the next priority to be included.

3.6. The use of cheap portable computers in the field of computer assisted instruction for the rural areas is an important application that needs investigation.

Some of the scientific applications of computer are often linked to other research project from related disciplines. These are usually undertaken at one of the University Computer installations because only such sites are suitably qualified technical staff available to give proper advice and guidance. It is apparent that much research that could use computers in this way is not being undertaken due to the shortage of technical manpower. A case for the establishment of full-time technical systems analysts/programmers at University computer installations is long overdue.

Example of the projects currently identified at the University of Nairobi are:

a) access and analysis to landsat setellite data recorded in magnetic tape in the country.

b) merging of rainfall data on magnetic tape to provide a disc based file.

c) establishment of a research profile database of all on-going research projects in the country.

d) creation and access of gynaecological records at the teaching hospital over the past 10 years to form a database for research.

e) processing of statistical records of infant mortality in Nairobi.

f) provision of experimental software to enable surgeons to diagnose the need or otherwise of surgery in a particular case.

In the above research projects and technical applications the most important requirement is the coordination of effort, avoidance of duplication, and communication of work already undertaken and in progress.

4. Bibliography

1. UNITED NATIONS - The Applications of Computer Technology for Development - First Report ST/ECA/138 (1971)

2. DIGITAL Distributed Systems Handbook (1978)

3. SCOTT, Robert - The problems of a Computer Installation in a Developing Country: 4th Annual Conference on Computer Science Cairo, Egypt (1979)

4. General Observations on Computer Managers Seminar at E.A.M.I. Arusha, 1979

(e) List of Computer Applications with particular Relevance to the African Region

The most commonly enumerated applications were:

Census
Health
Accounting
Education, e.g. examination processing
Migration statistics
Agricultural application, e.g. SCAPA
Environment control, e.g. Meteorology
Motor Vehicle registration
Voters registration
Payroll

Other applications mentioned were:

Forecasting
Personnel records and manpower planning
Exploration
Library automation
Research
Industrial Development
Customer utility billing
Stock recording and control
Statistical Analysis
National Insurance
Imports & Foreign
Passport and immigration processing
Veterinary
Fisheries Statistics
Geological survey
Tourist statistics
Environmental conservation including wildlife protection

VI List of Participants for Regional Meeting Computer Centre Directors in Africa

(April 14th - 18th April, 1980)

1. William D.S. Magambo	Data Processing Manager Computer Department Tanzania Electric Supply Company Limited P.O. Box 9024 DAR-ES-SALAAM Tanzania.
2. Professor P.E. Mugambi	Professor & Head Department of Mathematics Department of Mathematics Makerere University P.O. Box 7062 KAMPALA Uganda
3. M.N.J. Lambert	Data Processing Manager Ministry of Finance Data Processing Unit P.O. Box 31998 LUSAKA Zambia
4. P.E. Chilambe	Chief Data Processing Officer Ministry of Finance Data Processing Unit P.O. Box 30139 BLANTYRE Malawi
5. Signate Cheikh Oumar	Directeur Exploitation D.T.A.I. Ministere des Finances DAKAR Senegal
6. Dr. O. Abass	Head of Department of Computer Sciences University of Lagos LAGOS Nigeria Representing also OAU/STRC

VI List of Participants for Regional Meeting Computer Centre Directors in Africa

7. Samuel Olufunso Kumolu	Computer Facilities Coordinator Nigerian Steel Development Authority P.O. Box 3034, SURULERE LAGOS Nigeria
8. Jacob Gbago	Data Processing Manager West African Examinations Council PMB 1022 YABA LAGOS Nigeria

Observer

9. S.R. Sijaona	Unesco National Commission United Republic of Tanzania Ministry of Education DAR-ES-SALAAM Tanzania

Secretariat of the Meeting

10. E.A. Owolabi	Programme Specialist Informatics Section SC/SER UNESCO 7, place de Fontency, 75700 PARIS

Consultants (Unesco)

11. Prof. R.J.P. Scott	Director Institute of Computer Science University of Nairobi P.O. Box 30197 NAIROBI Kenya.
12. M.J. Shio	Consultant in Management Applications of EDP ESAMI P.O. Box 3030 ARUSHA Tanzania